

AD-A252 666



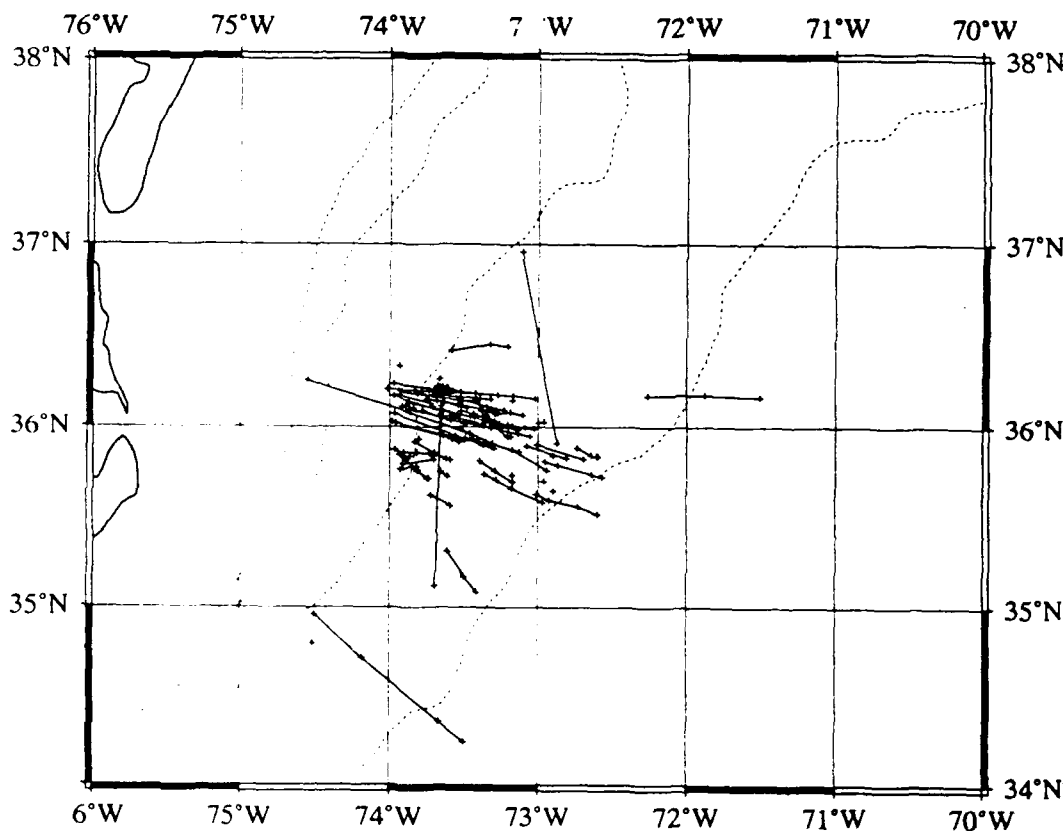
(2)

The SYNOP Experiment:

XBT Data for the Period

January 1988 to February 1990

DTIC  
ELECTE  
JUL 13 1992  
S A D



92-18227



Technical Report

This document has been approved  
for public release and sale; its  
distribution is unlimited.

Graduate School of Oceanography

University of Rhode Island

Narragansett, Rhode Island

**Graduate School of Oceanography  
University of Rhode Island**

Reproduction of the material contained in this report, in whole or in part,  
is permitted for any purpose of the United States Government.

Distribution of this document is unlimited.

**The SYNOP Experiment: XBT Data for the Period  
January 1988 to February 1990**

by

**Sandra Anderson-Fontana**

**H. Thomas Rossby**

**Technical Report**

**Reference 92-2**

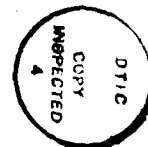
**May 1992**

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

Approved for Distribution

*Margaret Levin*

This research was made possible through the support of  
the Office of Naval Research under contracts  
N00014-87-K-0235 and N00014-90-J-1602.



## Table of Contents

	Page
1. Introduction .....	1
2. Technical Summary .....	1
3. Discussion .....	2
4. Acknowledgements .....	4
5. References .....	4
6. XBT Data .....	21

## List of Tables

	Page
1. XBT Launch Summary .....	5

## List of Figures

	Page
1. Average thermal cross section of the Gulf Stream .....	11
2. Launch sites of all SYNOP XBTs .....	12
3. XBT locations prior to RAFOS float deployments .....	13
4. Bar graph of XBT launch sites from figure 3 .....	14
5a. Gulf Stream axis positions January 1988 - February 1990 .....	15
5b. Gulf Stream axis positions January 1988 - December 1988 .....	16
5c. Gulf Stream axis positions January 1989 - February 1990 .....	17
6. Estimated mean path of the Gulf Stream .....	18
7. Distances of axis locations from mean Gulf Stream axis .....	19

## 1. Introduction

This report presents all the XBT data collected in association with the launching of 76 RAFOS floats in the Gulf Stream east of Cape Hatteras as part of the SYNOP (SYNOptic Ocean Prediction) experiment. The floats and XBTs were deployed during the period April 1988 through February 1990 by Capt. David Murphy of the H.O.S. *Bold Venture*, a commercial freighter operating between Norfolk, Virginia and Bermuda. From the end of January to the beginning of April 1988, six RAFOS floats (also part of the SYNOP experiment) were launched which failed to return any useful data due to a programming error in the floats. The XBT data associated with those floats are also included in this report. The RAFOS float data are summarized in a previous data report (Anderson-Fontana et al., 1991). The XBTs were taken to determine the launch site for each float in the axis of the Gulf Stream, identified as the point at which the 15°C isotherm crosses 450 meters.

## 2. Technical Summary

Sippican T7 probes, with a nominal depth of 760 m, were used. The acquisition equipment consisted of a stern deck launcher, a Bathysystems XBT deck unit, and an HP-85B computer. The raw data were stored on HP data cartridges and later transferred to a Concurrent computer via an RS-232 cable for processing. The XBTs (and associated floats) were launched in the vicinity of 36°N and 73°W while the freighter steamed along a NW-SE line across the Gulf Stream. When the XBT trace showed the 15°C isotherm at approximately 450 m, defined as the axis of the Stream, the RAFOS float was launched. Figure 1 shows an average thermal cross-section of the Gulf Stream. As the Stream is crossed from NW to SE the thermal structure deepens, and conversely, the isotherms rise when crossing from SE to NW. While the average structure may differ from the actual profile of the Stream at a given time, it is generally simple enough to allow the anticipation of the approximate launch site in advance. Typically, two to four XBTs were used to determine the actual launch site.

The raw voltages were converted into depth and temperature pairs using the Sippican-

provided algorithms. The XBT depths have not been adjusted for the 4.5% fall rate error that has been reported (Watts et al., 1990). Measurements shallower than 2 m and deeper than 810 m were deleted to remove data points outside the XBT's intended operating range. The data were then filtered using a median filter. Sampling was done every 0.1 s (approximately 0.6 m), with smoothing over five data points, resulting in a vertical resolution of about 3 m. A tolerance of 0.1°C was used, the median value replacing the measured value where the difference between the two was greater than the tolerance. These replaced data points are flagged with an asterisk in the archived files.

### 3. Discussion

Figure 2 shows the locations of all XBTs launched as part of the SYNOP experiment. A solid line connects the XBT launch sites associated with each RAFOS float. In most cases, the ship was steaming from west to east with a heading between 100° and 110°. A total of 214 XBTs were launched, summarized in Table 1. The data files for 11 of these were unavailable, so only launch positions are known. The locations of those XBTs launched immediately prior to the deployment of RAFOS floats are shown in figure 3. As previously stated, the floats were deployed as closely as possible to where the 15°C isotherm was at a depth of 450 m, defined to be the axis of the Gulf Stream. For each float deployment, the depths of the 15°C isotherm as determined from the associated XBTs were used to calculate first the slope of the isotherm, and then the exact location of the Gulf Stream axis (as previously defined) at the time of deployment. For float launches with only one XBT, the axis location was calculated using an estimated isotherm slope based on surrounding values and an average ship's heading of 105°. A bar graph of distance from the axis (figure 4) shows that most of the floats were launched very close to the axis. Excluding the one outlying data point at approximately 50 km, the mean distance between the Gulf Stream axis and final XBT launch position is 1.4 km with a standard deviation of 7.6 km. The negative distances correspond to floats launched north (shoreward) of the axis. Figure 5a shows the calculated axis positions for all float launches (excluding those seven associated with the XBTs for which there were

no data), covering the period of time from January 1988 through the beginning of February 1990. Figures 5b and 5c cover the periods January 1988 through December 1988 and January 1989 through the beginning of February 1990, respectively. During most of this time, the Gulf Stream axis near  $36^{\circ}\text{N}$  was located between  $73^{\circ}$  and  $74^{\circ}\text{W}$ . Those launches east of  $73^{\circ}\text{W}$  in figure 5c are from the period September and October 1989. This is in agreement with satellite imagery during these dates, which showed the Gulf Stream to be farther east than at other times throughout the period of interest.

To further examine the variability in the Gulf Stream axis position during this period of time, the calculated axis positions were compared to estimated mean paths of the Stream in the XBT launch region. A bearing of  $56^{\circ}\text{T}$  was used, as determined from Halkin et al., 1985. After looking at several mean paths with this bearing, a best estimate was chosen which intersected  $74^{\circ}\text{W}$  at  $35.75^{\circ}\text{N}$ , shown superimposed on the axis positions in figure 6. Figure 7 is a plot of the distance of the calculated axis locations projected to the mean axis vs. yearday from the end of January 1988 through the beginning of February 1990. The "yearday" axis is actually yearday + 366 for 1989 (1988 was a leap year) and yearday + 731 for 1990. The eight points between days 600 and 655 correspond to September and October 1989 when the Gulf Stream axis was farther east; those at 666 and 743 correspond to the two launches south of  $35^{\circ}\text{N}$  and west of  $74^{\circ}\text{W}$  (see figure 5a), where the axis orientation of  $56^{\circ}$  would be inaccurate. Deleting these ten data points, all greater than 40 km from the estimated mean axis, results in a mean distance of 2.0 km with a standard deviation of 17.8 km. The data files for those XBTs launched from mid-January 1989 through the beginning of April 1989 are missing, corresponding to the gap in the plot approximately between days 380 and 470 (a total of seven out of 82 float launches). As in figure 4, negative distances correspond to those points north (shoreward) of the Stream axis. Other than in the early fall of 1989, as previously noted, there was little variation in the Gulf Stream axis location in the region of the XBT launches.

The next section contains the individual XBT plots arranged according to launch number, referenced in Table 1. The numbering is sequential, and any missing XBTs either were not

launched (12, 29, 30, 60) or were launched as tests near the shore of Cape Hatteras (10, 11, 31-35). The raw data files for XBTs 73 and 104 through 111 are missing, so only the launch information is known. The temperature and depth scales are all 0-30°C and 0-800 m, respectively. The XBT launches are also cross-referenced to the RAFOS float launches (Table 1). The first 28 XBTs correspond to the six floats in early 1988 that did not return any data. XBTs 124, 125 and 126 were launched on the Sargasso Sea side of the Gulf Stream after the launch of float 198; 42, 188 and 193 were launched independent of any floats. The reader should note that the data have been conservatively edited, and depending on the application of the data, further examination and editing may be required.

#### 4. Acknowledgements

We thank Capt. David Murphy of the *Bold Venture* for his support and cooperation in the launching of the XBTs, recording of the data, and prompt return of the launch information and data tapes to us. We extend our appreciation to him for his precise launching of the RAFOS floats in the axis of the Gulf Stream. Mr. Jim Fontaine was responsible for establishing and maintaining the excellent cooperation between the University of Rhode Island and Capt. Murphy. Support for this project was provided by the Office of Naval Research under grants N00014-87-K-0235 and N00014-90-J-1602.

#### 5. References

- Anderson-Fontana, S. and H. T. Rossby. RAFOS Floats in the SYNOP Experiment, 1988-1990. G.S.O. Univ. of Rhode Island Tech. Report 91-7, September 1991, 155 pp.
- Halkin, D., T. A. Rago and T. Rossby. Data Report of the Pegasus Program at 73°W. G.S.O. Univ. of Rhode Island Tech. Report 85-2, December 1985, 198 pp.
- Watts, R., K. Mohammed and E. Fields, 1990. XBT Systematic Depth Error and Correction. The SYNOPTician, vol. 1, no. 2, pp. 2-3.

**Table 1. XBT Launch Summary**

<b>XBT No.</b>	<b>Yearday</b>	<b>Year</b>	<b>Time (GMT)</b>	<b>Lat(N)</b>	<b>Long(W)</b>	<b>Float No.</b>
1	23	1988	04:10	36.258	74.543	
2	23	1988	07:49	36.078	73.870	
3	23	1988	09:39	35.958	73.472	
4	23	1988	11:00	35.869	73.177	
5	23	1988	12:06	35.756	72.943	
6	27	1988	23:13	35.642	72.897	
7	28	1988	00:35	35.728	73.182	
8	34	1988	10:25	36.092	73.787	
9	34	1988	11:12	36.032	73.600	
13	44	1988	09:24	36.022	73.965	
14	44	1988	10:37	35.945	73.650	
15	44	1988	10:57	35.925	73.591	
16	44	1988	11:15	35.913	73.540	
17	55	1988	10:59	36.072	73.972	
18	55	1988	12:27	35.947	73.567	
19	55	1988	13:08	35.894	73.376	
20	55	1988	13:26	35.877	73.302	
21	64	1988	09:08	36.197	73.929	
22	64	1988	10:45	36.146	73.517	
23	64	1988	11:06	36.145	73.440	
24	64	1988	11:14	36.145	73.422	
25	72	1988	08:50	35.117	73.700	
26	72	1988	09:29	36.116	73.662	
27	92	1988	09:11	36.177	73.933	
28	92	1988	10:01	36.132	73.735	
36	115	1988	08:36	36.209	74.013	133
37	115	1988	09:49	36.198	73.672	133
38	115	1988	10:40	36.185	73.427	133
39	115	1988	11:10	36.178	73.275	133
40	115	1988	11:31	36.175	73.171	133
41	115	1988	12:02	36.157	73.020	133
42	119	1988	20:42	36.338	73.937	
43	125	1988	08:06	36.026	73.987	126
44	125	1988	10:00	35.923	73.507	126
45	125	1988	10:21	35.916	73.417	126
46	125	1988	10:34	35.911	73.362	126
47	134	1988	08:04	36.136	73.877	138
48	134	1988	09:31	36.057	73.463	138



XBT No.	Yearday	Year	Time (GMT)	Lat(N)	Long(W)	Float No.
49	134	1988	10:02	36.026	73.328	138
50	134	1988	10:40	35.987	73.155	138
51	142	1988	08:10	36.172	73.973	120
52	142	1988	09:32	36.082	73.648	120
53	142	1988	10:57	36.022	73.267	120
54	142	1988	11:38	35.995	73.095	120
55	142	1988	11:51	35.985	73.032	120
56	157	1988	09:40	36.018	73.510	122
57	157	1988	10:11	36.004	73.373	122
58	161	1988	22:47	36.026	72.961	139
59	161	1988	23:02	36.022	73.000	139
61	167	1988	11:28	36.061	73.359	135
62	167	1988	11:34	36.049	73.335	135
63	167	1988	12:01	35.996	73.252	135
64	174	1988	10:01	36.021	73.335	121
65	174	1988	10:30	35.994	73.208	121
66	174	1988	10:46	35.982	73.137	121
67	181	1988	10:07	36.067	73.297	123
68	181	1988	10:27	36.098	73.328	123
69	195	1988	10:21	36.153	73.542	125
70	195	1988	11:05	36.112	73.350	125
71	195	1988	11:21	36.087	73.288	125
72	202	1988	08:40	36.155	73.753	140
73	202	1988	10:04	36.096	73.382	140
74	202	1988	10:31	36.073	73.277	140
75	211	1988	08:59	36.126	73.532	127
76	223	1988	09:40	36.222	73.669	124
77	223	1988	09:46	36.223	73.652	124
77B	233	1988	08:03	36.097	73.877	142
78	233	1988	08:52	36.060	73.677	142
79	233	1988	09:01	36.053	73.648	142
80	244	1988	08:17	36.204	73.833	129
81	244	1988	08:35	36.187	73.787	129
82	254	1988	08:45	36.177	73.717	131
83	254	1988	10:03	36.158	73.398	131
84	254	1988	10:21	36.153	73.325	131
85	261	1988	10:45	36.070	73.353	134
86	288	1988	10:21	36.021	73.490	137
87	288	1988	11:05	36.035	73.599	137

XBT No.	Yearday	Year	Time (GMT)	Lat(N)	Long(W)	Float No.
88	288	1988	11:30	36.048	73.659	137
89	293	1988	16:26	35.811	73.600	119
90	293	1988	17:04	35.842	73.709	119
91	293	1988	17:42	35.853	73.823	119
92	293	1988	18:12	35.855	73.910	119
93	302	1988	08:06	36.240	73.975	141
94	302	1988	09:07	36.209	73.707	141
95	302	1988	09:21	36.205	73.645	141
96	313	1988	09:54	36.153	73.743	130
97	313	1988	10:07	36.148	73.760	130
98	324	1988	09:01	36.120	73.893	136
99	324	1988	09:15	36.105	73.845	136
100	344	1988	09:42	36.042	73.627	128
101	344	1988	10:05	36.042	73.537	128
102	7	1989	09:22	36.093	73.657	132
103	7	1989	09:49	36.067	73.552	132
104	14	1989	09:50	35.930	73.815	175
105	25	1989	10:22	36.060	73.597	176
106	25	1989	11:18	36.013	73.385	176
107	34	1989	11:02	36.052	73.438	177
108	46	1989	10:48	36.163	73.528	179
104B	70	1989	14:09	35.916	73.839	180
105B	70	1989	14:49	35.854	73.709	180
109	83	1989	21:03	36.203	73.740	178
110	83	1989	21:54	36.200	73.582	178
111	97	1989	08:44	36.134	73.642	181
112	102	1989	19:52	35.707	73.759	182
113	102	1989	20:29	35.777	73.857	182
114	102	1989	20:56	35.757	73.935	182
115	107	1989	08:31	36.114	73.717	185
116	111	1989	17:39	35.791	73.917	184
117	111	1989	18:42	35.815	73.710	184
118	111	1989	18:59	35.849	73.741	184
119	116	1989	08:56	36.190	73.681	187
120	116	1989	09:17	36.183	73.608	187
121	120	1989	17:40	36.177	73.654	186
122	120	1989	17:55	36.206	73.684	186
123	126	1989	13:31	36.267	73.670	198
124	126	1989	19:55	36.175	72.257	

XBT No.	Yearday	Year	Time (GMT)	Lat(N)	Long(W)	Float No.
125	126	1989	21:56	36.177	71.882	
126	126	1989	23:54	36.167	71.513	
127	131	1989	20:32	36.194	73.528	191
128	131	1989	21:06	36.217	73.615	191
129	131	1989	21:11	36.217	73.625	191
130	131	1989	21:36	36.228	73.683	191
131	137	1989	12:03	36.113	73.921	189
132	137	1989	12:08	36.117	73.897	189
133	141	1989	16:30	35.754	73.816	190
134	141	1989	17:17	35.840	73.938	190
135	141	1989	17:39	35.833	73.871	190
136	148	1989	08:27	36.186	73.820	193
137	148	1989	09:01	36.167	73.693	193
138	148	1989	09:13	36.156	73.647	193
139	152	1989	16:19	35.709	73.747	192
140	152	1989	16:54	35.750	73.824	192
141	152	1989	17:23	35.814	73.892	192
142	152	1989	17:27	35.821	73.902	192
143	152	1989	17:56	35.869	73.966	192
144	161	1989	10:10	36.424	73.588	183
145	161	1989	11:12	36.458	73.327	183
146	161	1989	11:42	36.447	73.208	183
147	165	1989	19:47	35.777	73.829	195
148	175	1989	09:28	36.142	73.687	197
149	175	1989	10:01	36.119	73.547	197
150	175	1989	10:15	36.106	73.488	197
151	179	1989	17:20	35.815	73.629	196
152	189	1989	09:18	36.005	73.377	143
153	189	1989	10:10	35.962	73.142	143
154	189	1989	10:30	35.944	73.062	143
155	193	1989	15:32	35.945	73.210	200
156	202	1989	09:32	36.089	73.392	202
157	202	1989	09:54	36.076	73.290	202
158	202	1989	10:16	36.080	73.192	202
159	202	1989	10:36	36.065	73.108	202
160	207	1989	17:12	35.721	73.622	203
161	207	1989	17:30	35.747	73.667	203
162	217	1989	09:42	36.038	73.357	205
163	217	1989	10:13	36.013	73.212	205

XBT No.	Yearday	Year	Time (GMT)	Lat(N)	Long(W)	Float No.
164	222	1989	16:11	35.946	73.215	204
165	222	1989	16:41	36.000	73.292	204
166	222	1989	16:57	36.017	73.310	204
167	230	1989	10:16	36.959	73.115	206
168	230	1989	11:14	35.907	72.872	206
169	235	1989	18:53	35.694	72.964	207
170	245	1989	11:26	35.804	72.953	208
171	245	1989	12:34	35.730	72.637	208
172	245	1989	12:51	35.718	72.567	208
173	250	1989	08:04	35.509	72.593	209
174	250	1989	08:51	35.552	72.728	209
175	250	1989	09:59	35.589	72.924	209
176	250	1989	10:28	35.621	73.012	209
177	269	1989	11:55	35.082	73.420	210
178	269	1989	12:29	35.167	73.504	210
179	269	1989	13:21	35.306	73.621	210
180	273	1989	11:24	35.900	73.007	211
181	273	1989	12:35	35.819	72.692	211
182	277	1989	16:37	35.832	72.595	212
183	277	1989	16:43	35.837	72.602	212
184	284	1989	11:37	35.891	73.076	213
185	284	1989	12:37	35.822	72.806	213
186	288	1989	10:34	35.838	72.638	214
187	288	1989	11:03	35.880	72.733	214
188	294	1989	08:16	35.782	72.867	
189	300	1989	17:11	34.240	73.505	215
190	300	1989	18:10	34.357	73.678	215
191	300	1989	21:06	34.712	74.182	215
192	300	1989	23:04	34.957	74.498	215
193	305	1989	16:55	35.837	72.898	
194	309	1989	16:18	35.575	72.967	194
195	309	1989	17:33	35.654	73.185	194
196	309	1989	18:12	35.700	73.292	194
197	309	1989	18:39	35.734	73.370	194
198	314	1989	12:24	35.932	73.453	199
199	314	1989	12:57	35.896	73.322	199
200	319	1989	14:34	35.691	73.176	201
201	319	1989	15:11	35.749	73.297	201
202	319	1989	15:46	35.806	73.400	201

XBT No.	Yearday	Year	Time (GMT)	Lat(N)	Long(W)	Float No.
203	322	1989	10:09	36.073	73.443	216
204	322	1989	10:24	36.056	73.377	216
205	335	1989	12:29	35.934	73.500	217
206	335	1989	13:15	35.883	73.317	217
207	346	1989	10:58	35.992	73.325	220
208	364	1989	02:07	35.557	73.598	221
209	364	1989	02:46	35.617	73.727	221
210	5	1990	11:46	36.124	73.400	222
211	5	1990	12:27	36.094	73.233	222
212	12	1990	22:13	34.795	74.509	223
213	15	1990	12:02	35.945	73.192	224
214	24	1990	10:46	36.026	73.364	238
215	24	1990	11:29	36.004	73.182	238
216	28	1990	17:26	35.858	73.130	239
217	28	1990	18:28	35.904	73.317	239
218	28	1990	19:22	35.961	73.471	239
219	28	1990	19:43	35.987	73.532	239
220	33	1990	12:09	36.089	73.527	240
221	33	1990	13:03	36.035	73.301	240
222	40	1990	15:02	36.147	73.173	241

Note: Float 119 (XBTs 89 through 92) was inadvertently excluded from the SYNOP float data report (Anderson-Fontana et al., 1991). However, it either didn't surface or failed to transmit after surfacing, so no data were returned. Raw data files for XBTs 73 and 104 through 111 are not available.

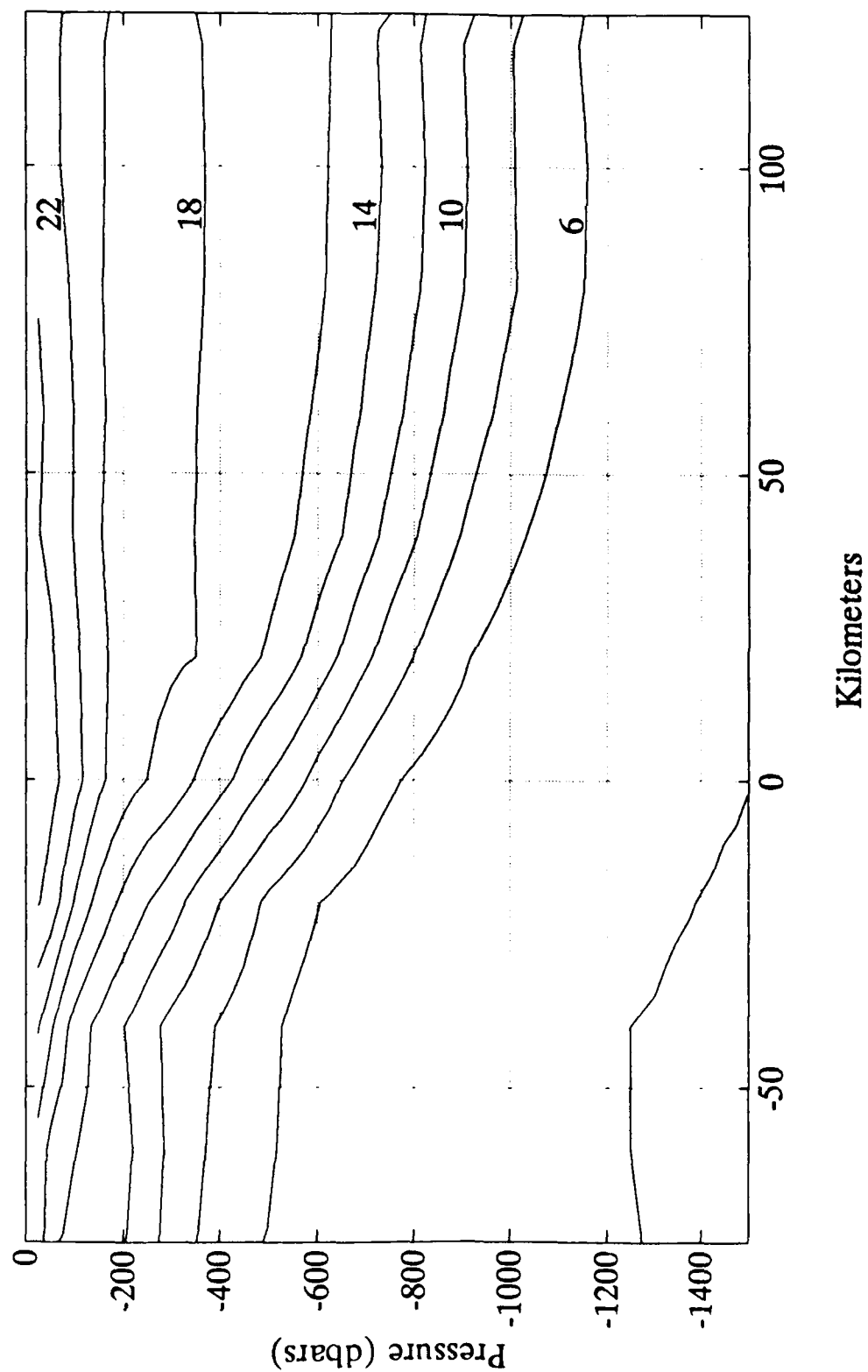


Fig. 1. Average thermal cross section of the Gulf Stream, as viewed looking downstream (adapted from Halkin et al. [1985], the origin being defined as the location halfway between where the 12°C isotherm crossed 400 m and where it crossed 600 m). Isotherms are labeled every 4°C.

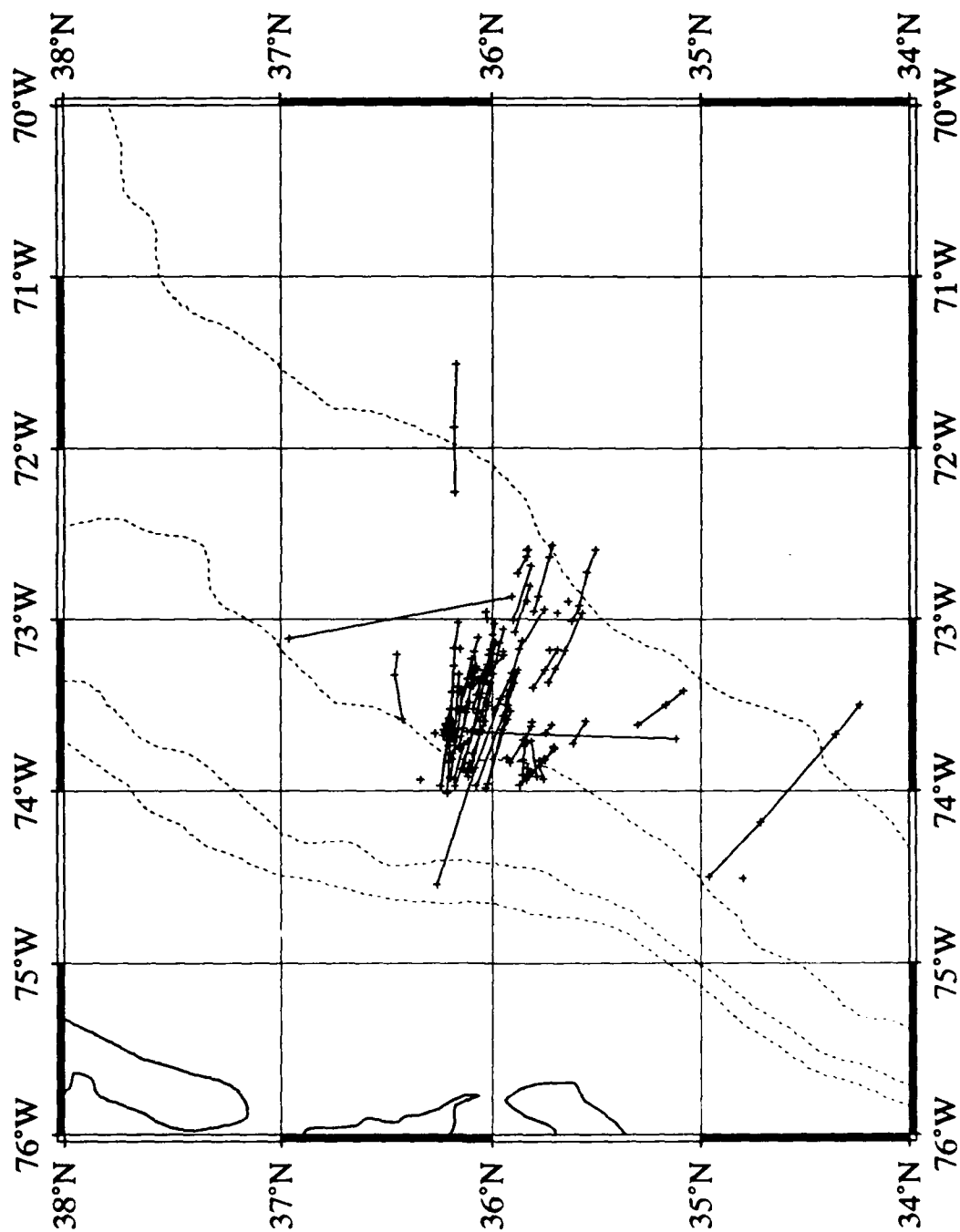


Fig. 2. Locations of all XBTs launched as part of the SYNOP experiment. Each solid line connects those XBT launch sites associated with a single RAFOS float deployment (with the exception of the three XBT's launched in the Sargasso Sea near 72°W). The dashed contour lines represent 1000, 2000, 3000 and 4000 meters.

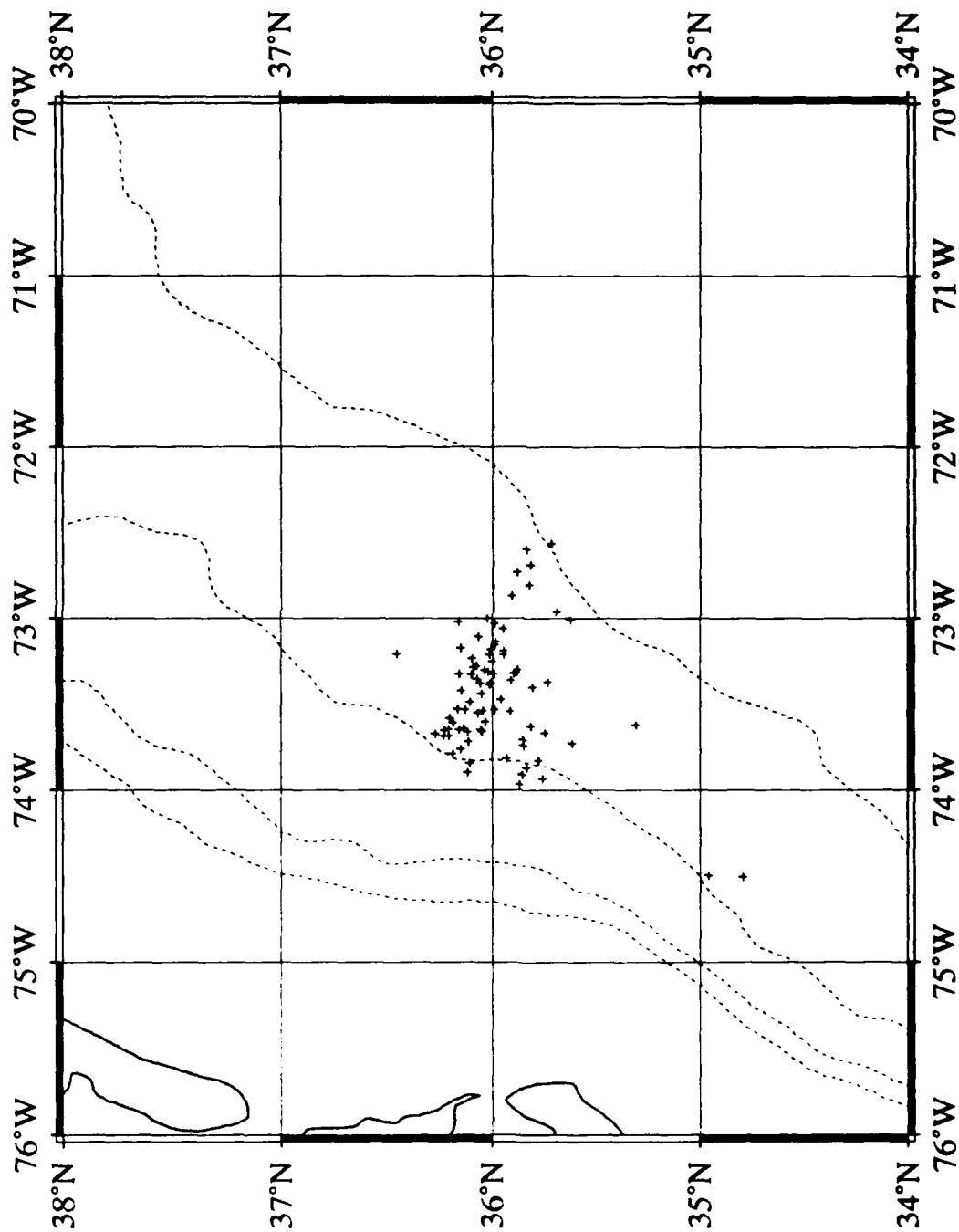


Fig. 3. Locations of those XBTs launched just prior to the deployment of the RAFOS floats. The float deployment sites were chosen where the 15°C isotherm intersected 450 m as shown by the XBTs.



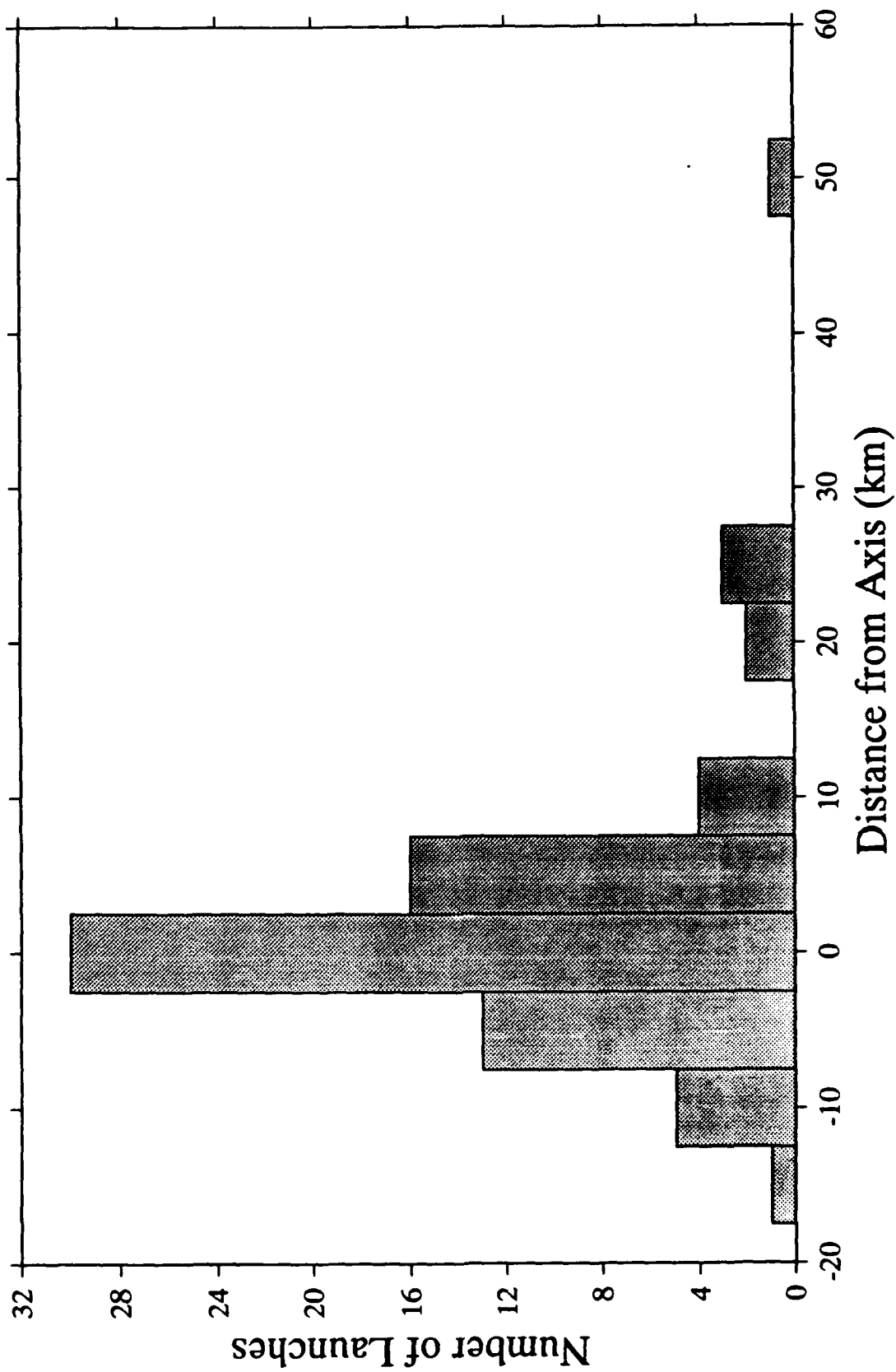


Fig. 4. Bar graph showing distances of the XBT launch sites in figure 3 from the Gulf Stream axis location calculated for each site. Negative distances correspond to sites north (shoreward) of the Stream axis. Excluding the one outlying data point at 50 km, the mean distance is 1.4 km with a standard deviation of 7.6 km.

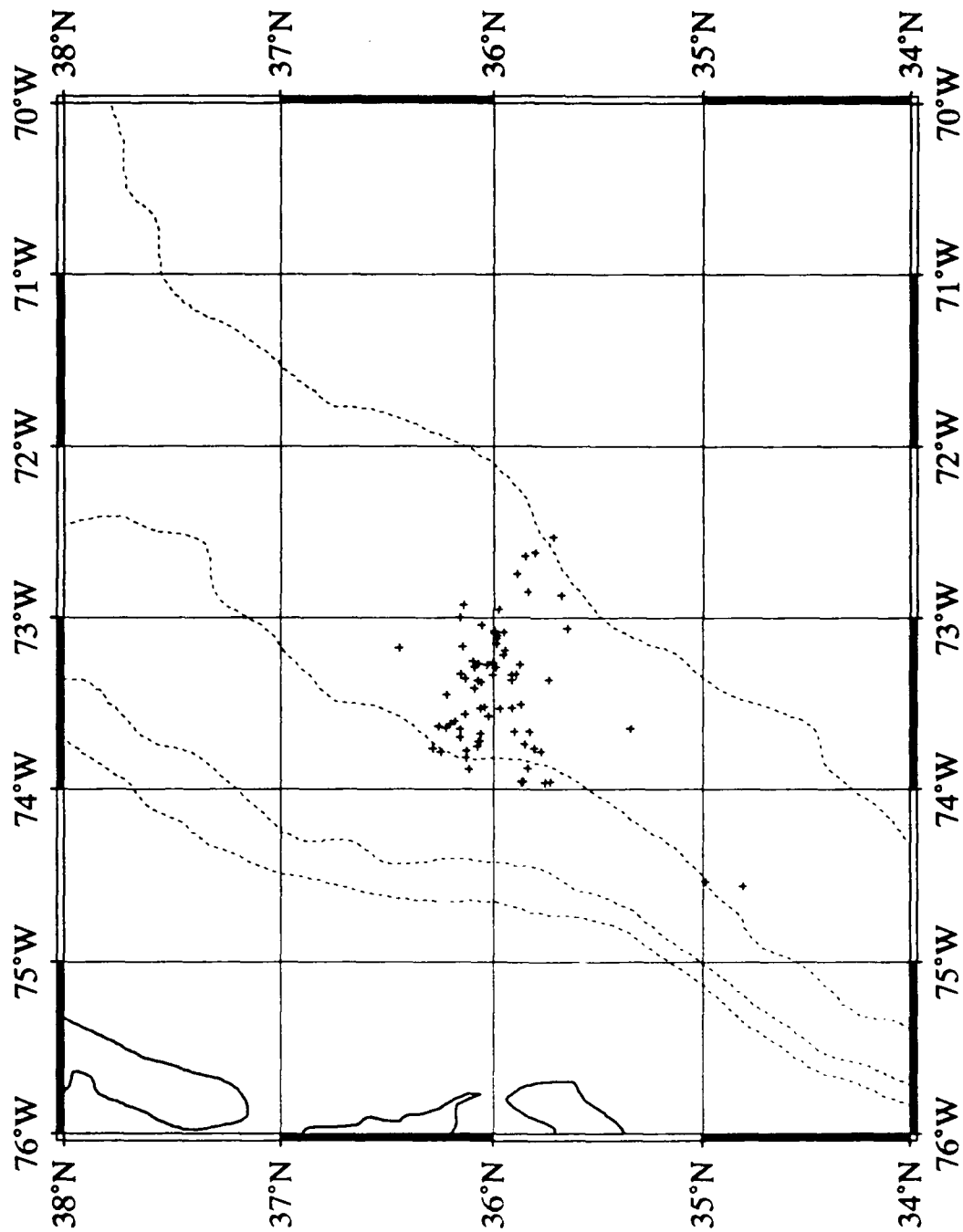


Fig. 5a. Calculated Gulf Stream axis positions at the times of all RAFOS float launches (excluding those seven associated with the XBTs for which there were no data available), from January 1988 through the beginning of February 1990.

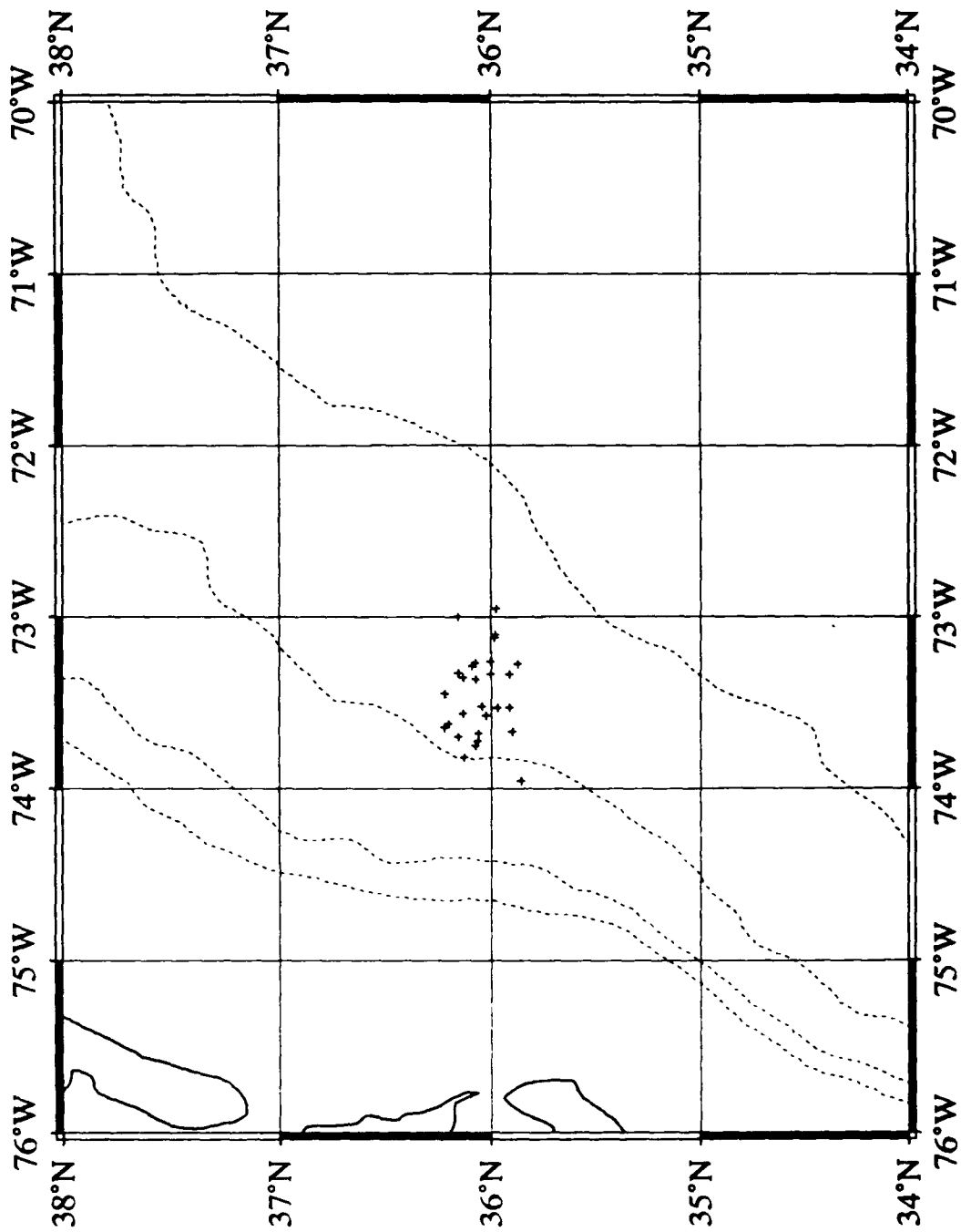


Fig. 5b. Calculated Gulf Stream axis positions as in figure 5a, covering January 1988 through December 1988.

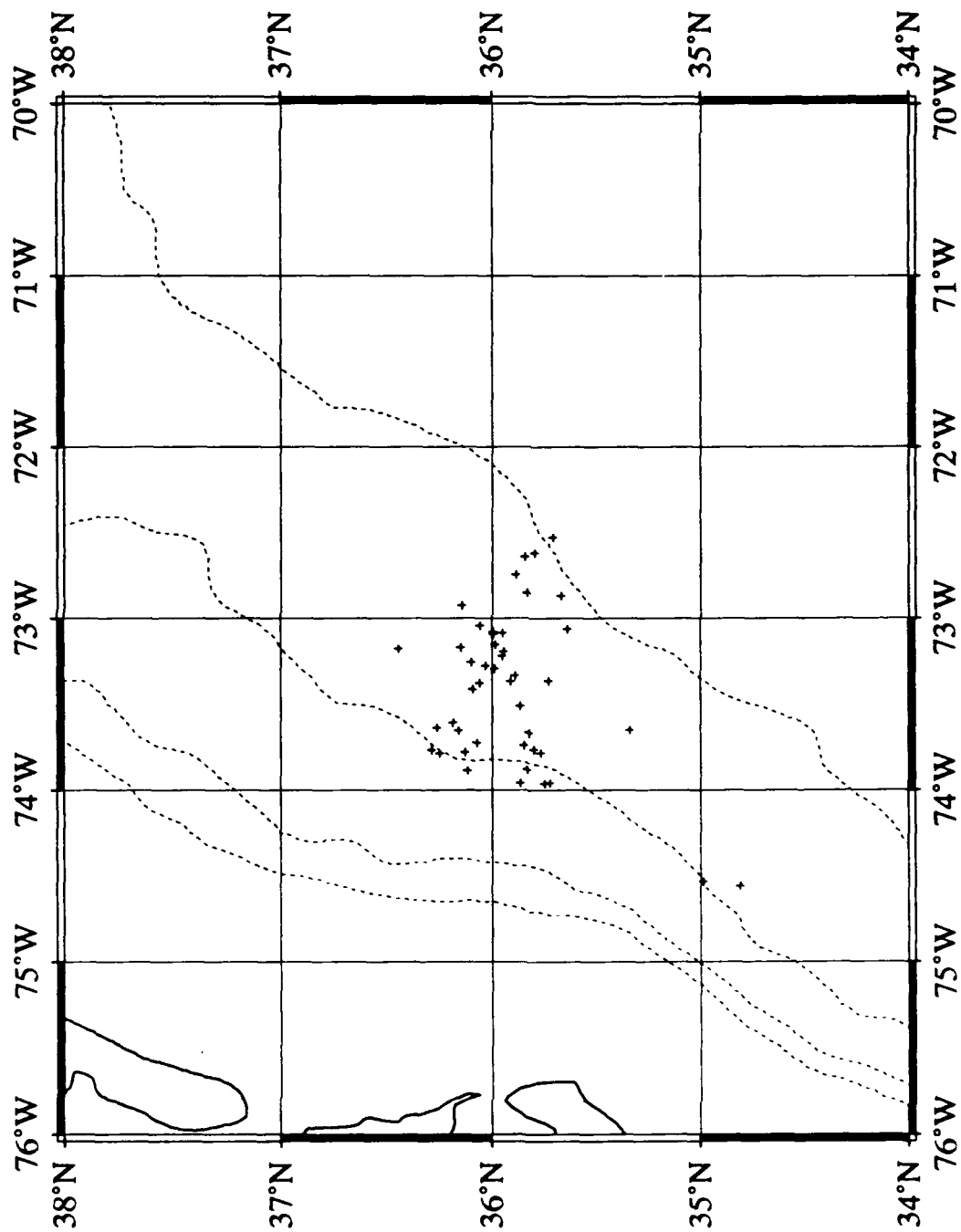


Fig. 5c. Calculated Gulf Stream axis positions as in figures 5a and 5b, covering January 1989 through the beginning of February 1990.

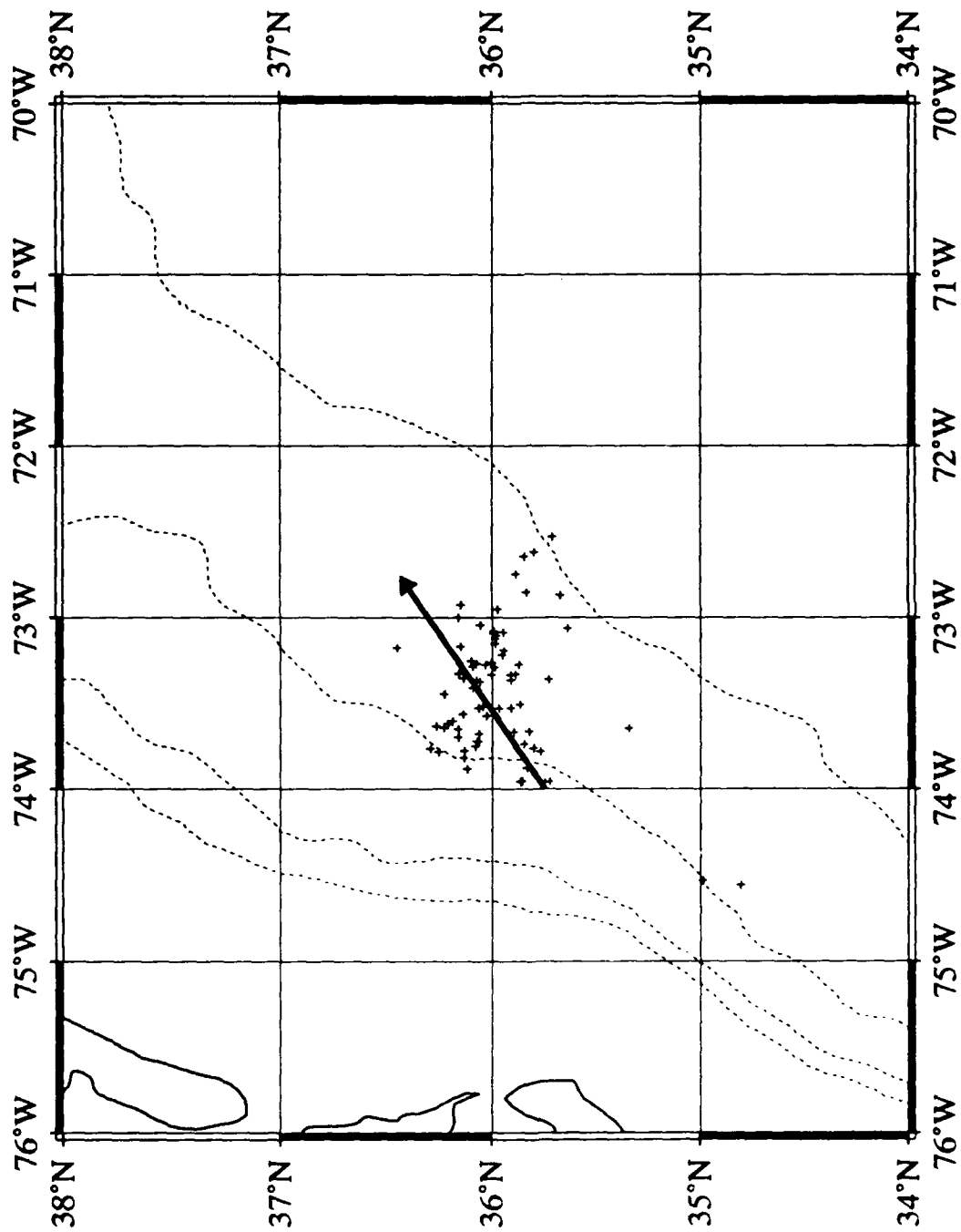


Fig. 6. Estimated mean path of the Gulf Stream superimposed on the calculated axis positions from figure 5a.

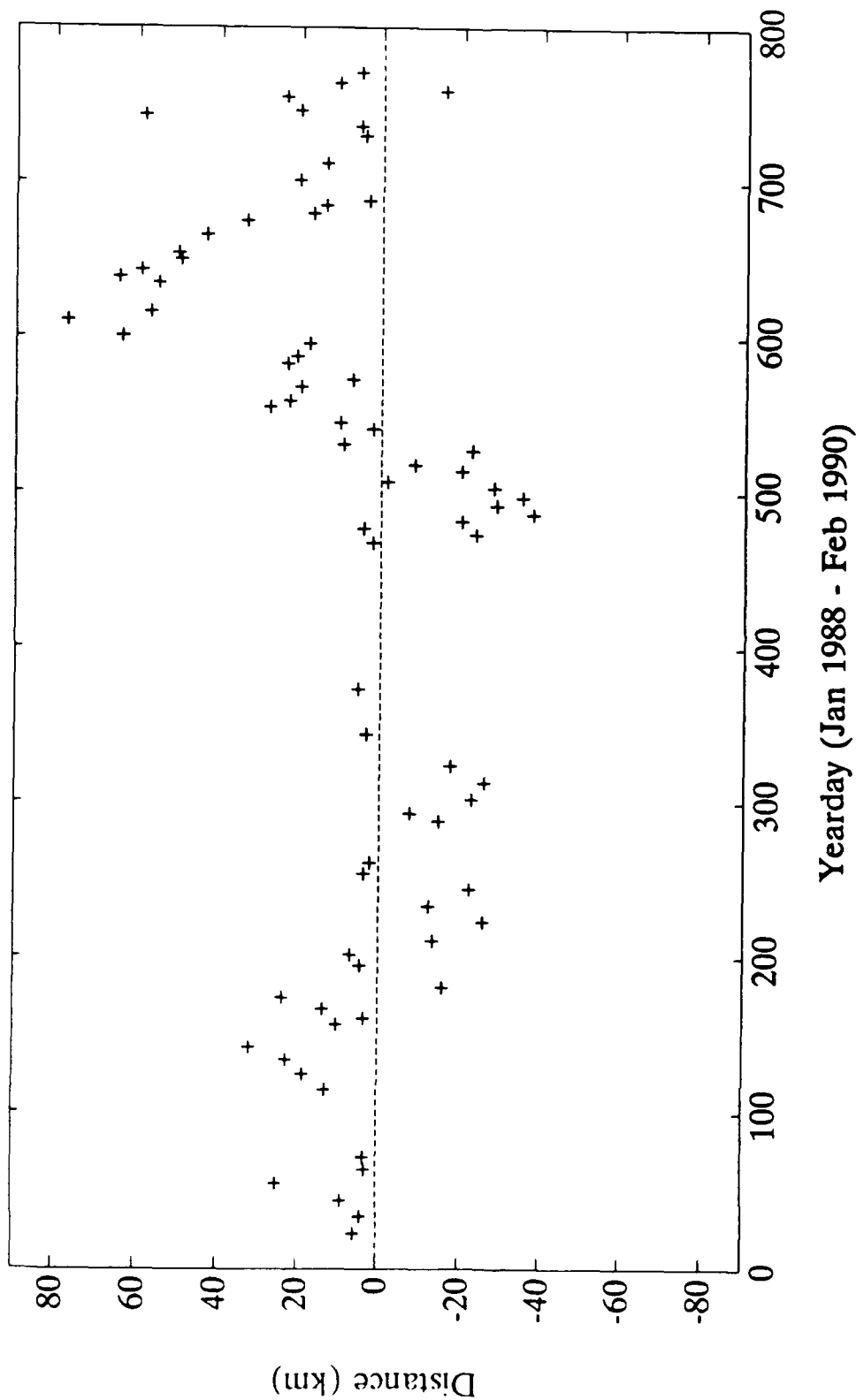
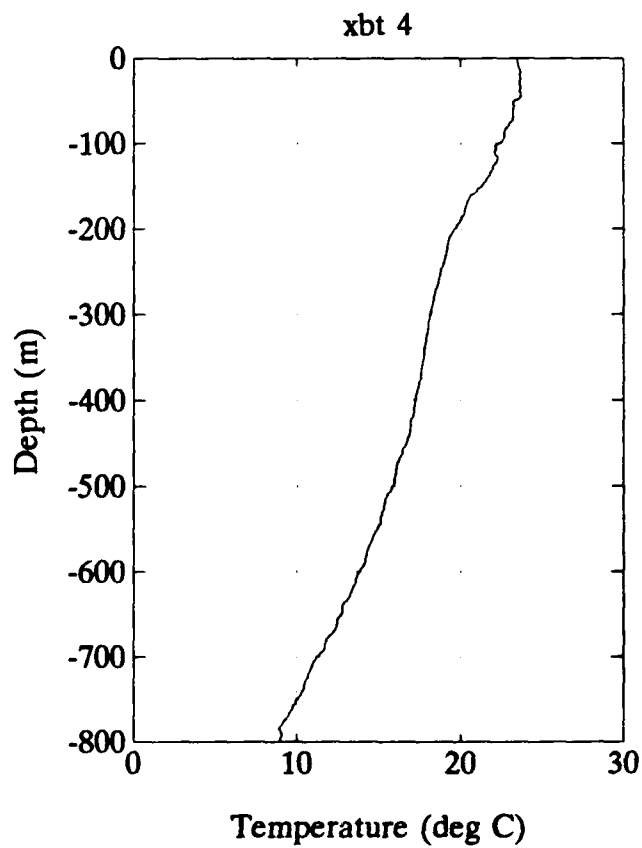
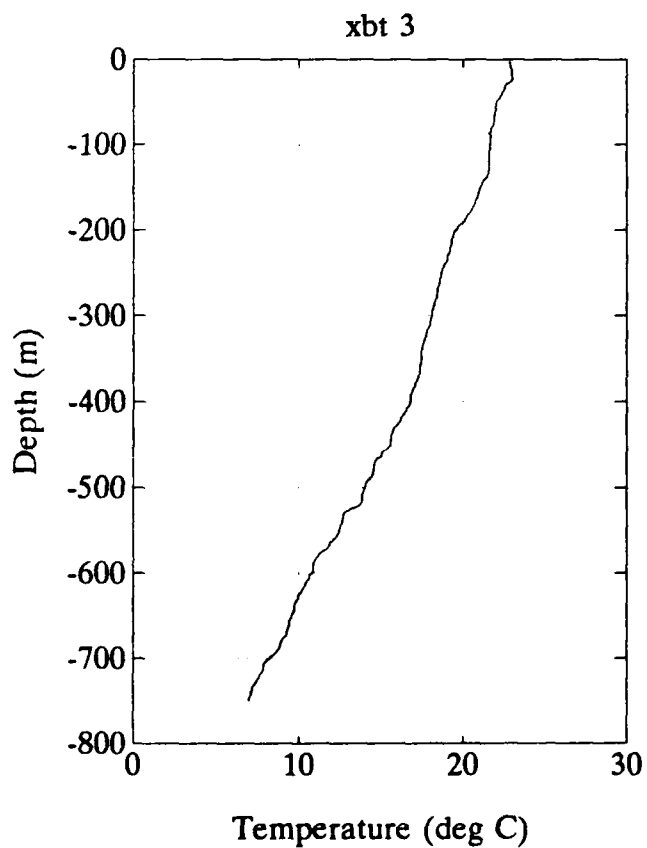
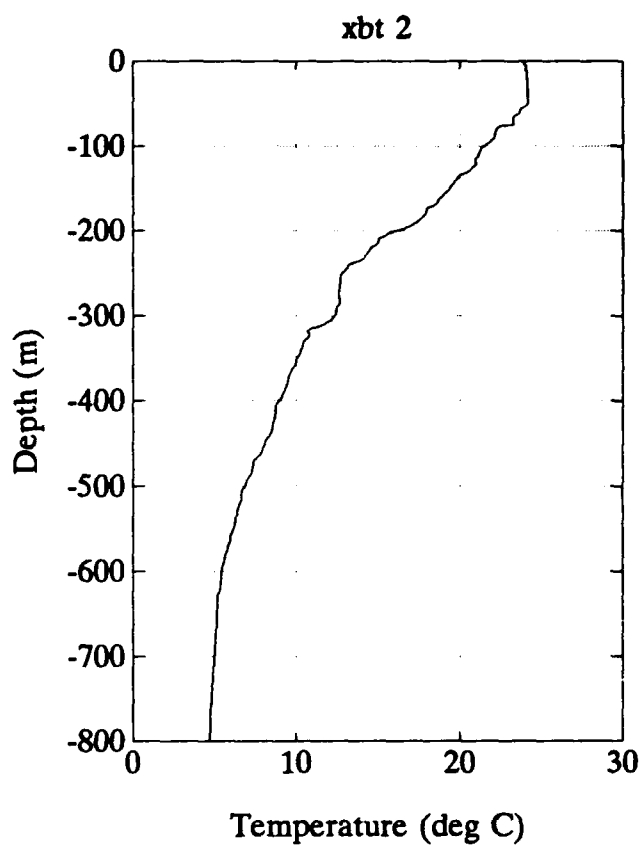
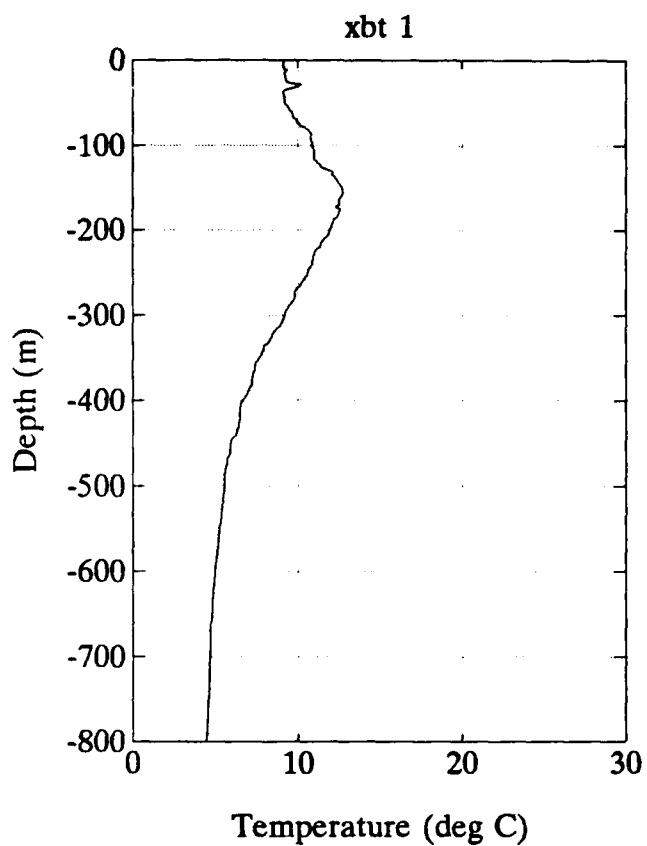
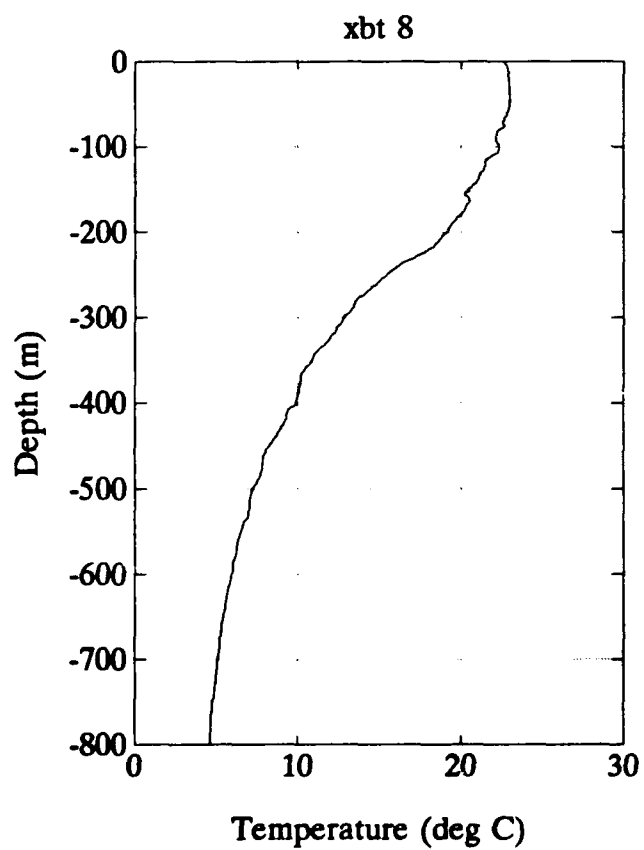
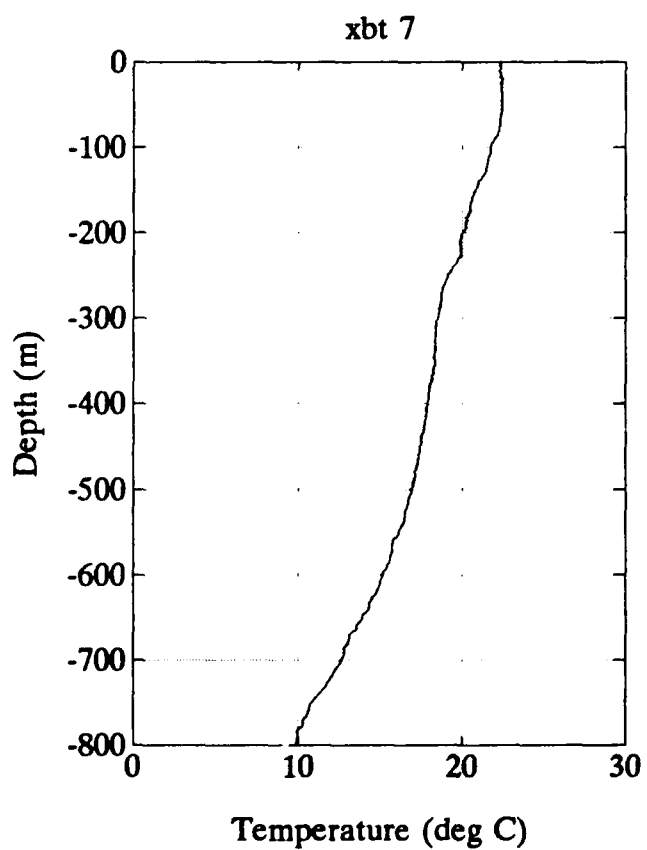
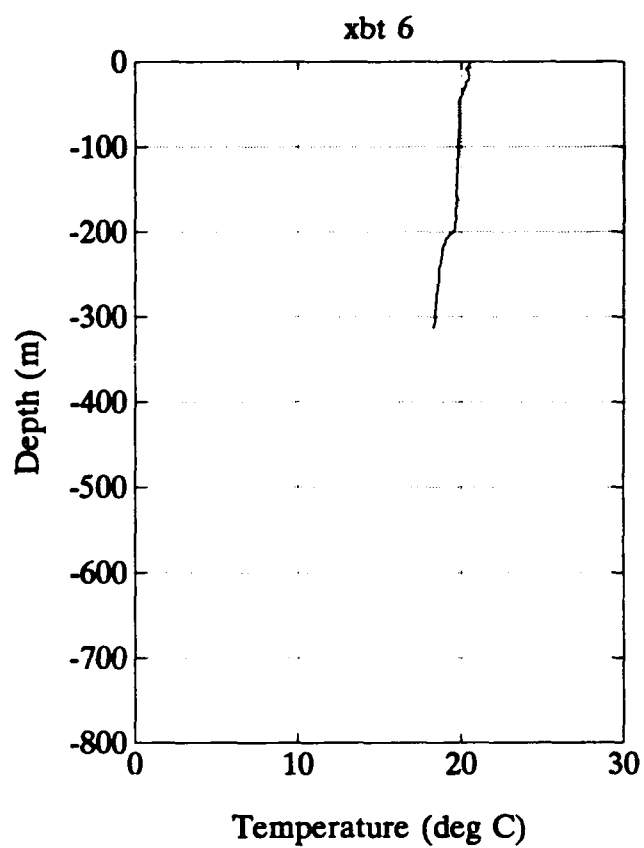
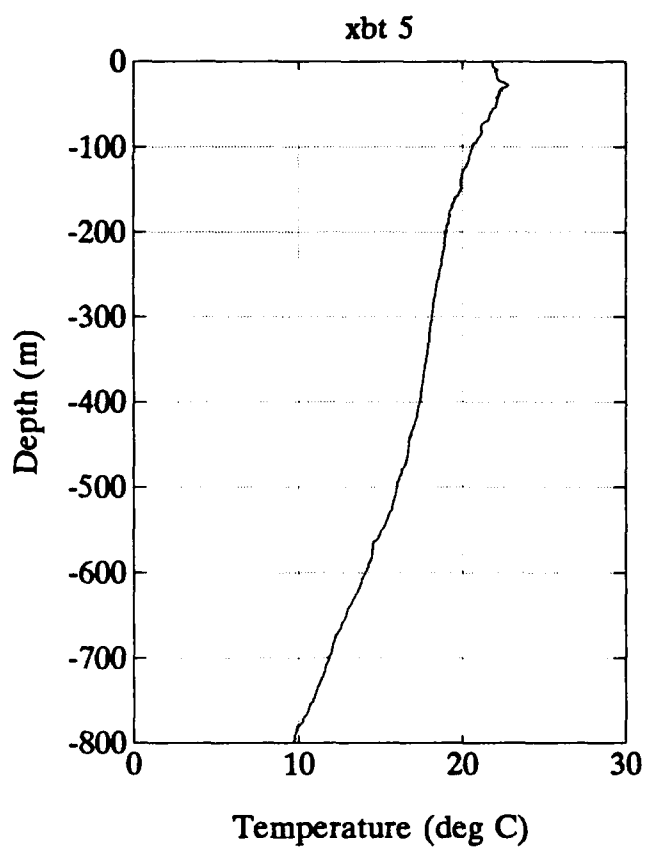


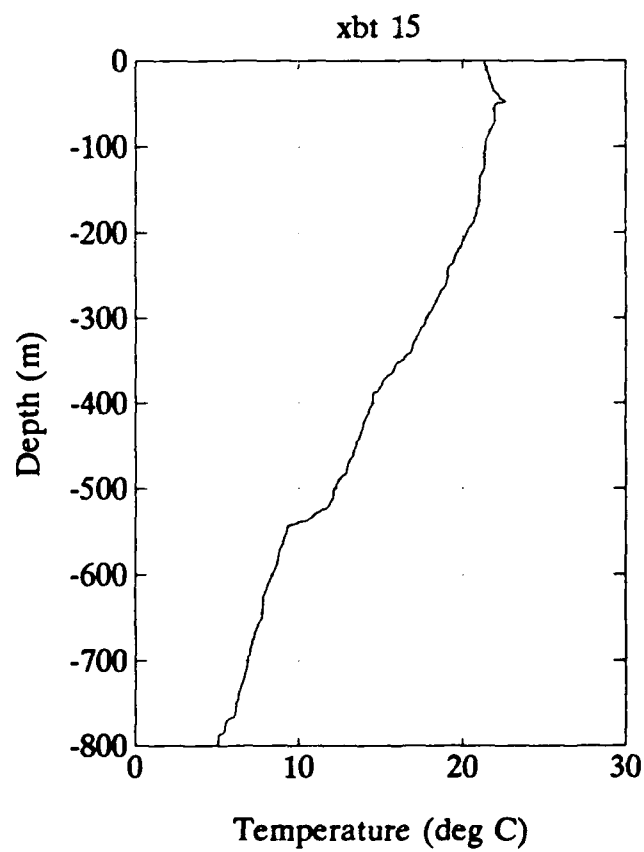
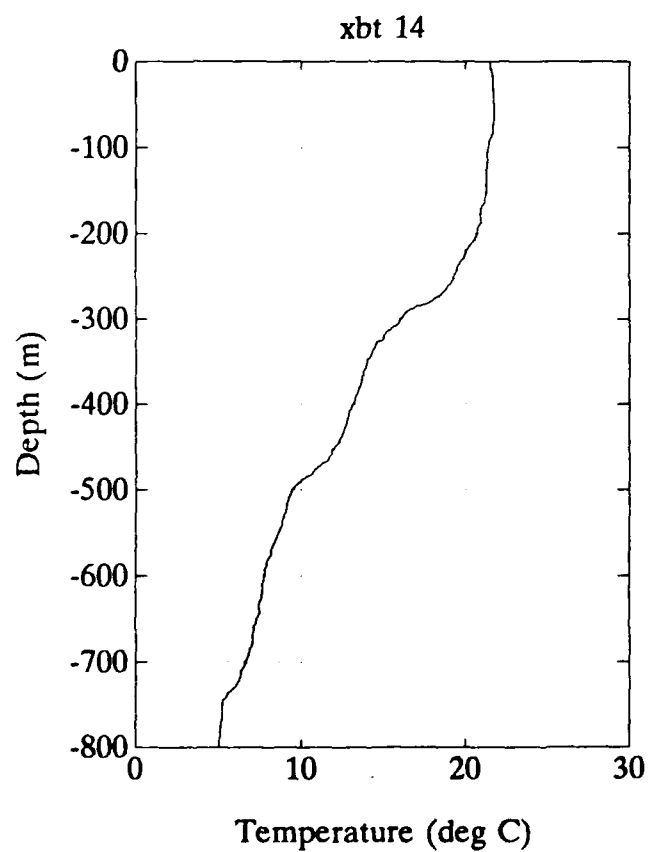
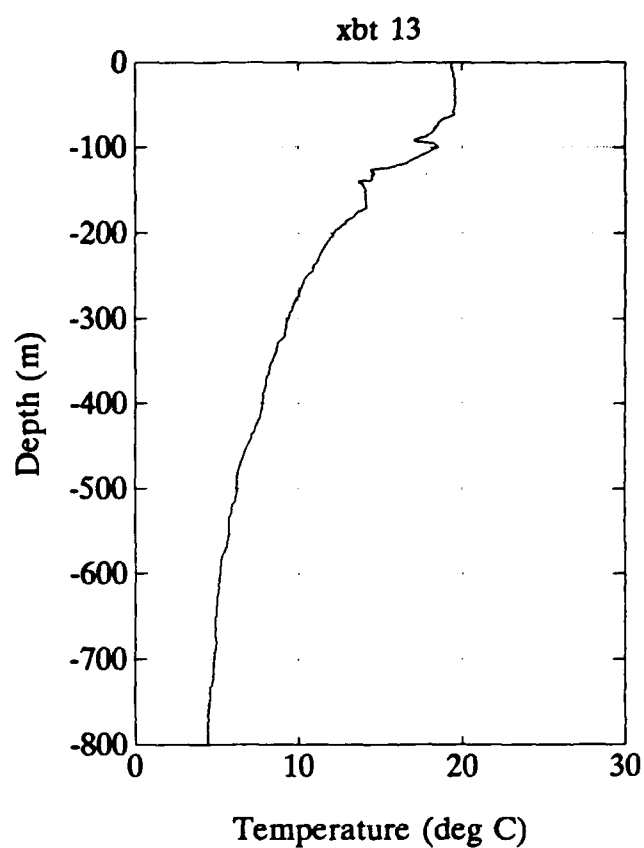
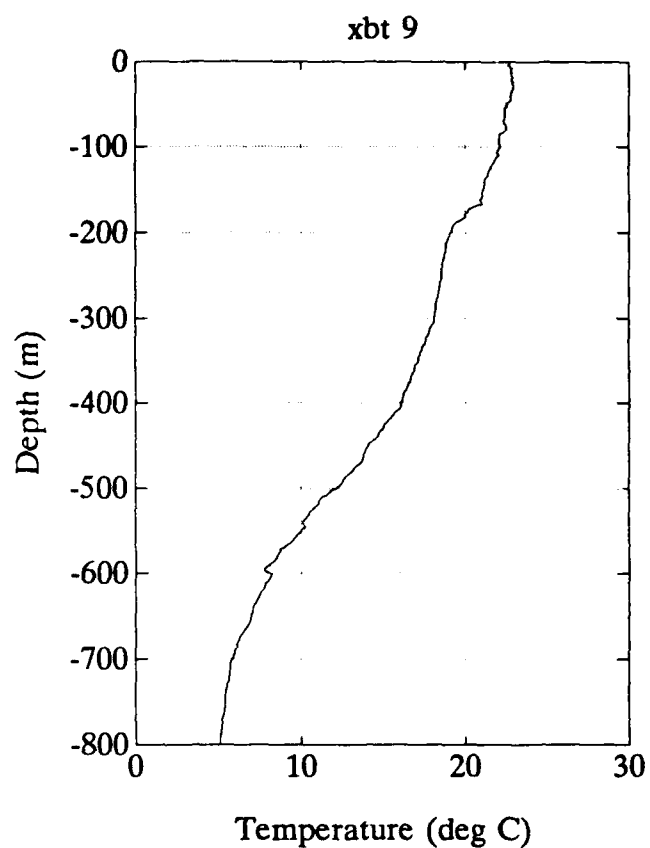
Fig. 7. Distances of the calculated axis locations projected to the mean Gulf Stream axis shown in figure 6 vs. yearday from January 1988 through the beginning of February 1990. The "yearday" axis is yearday + 366 for 1988 through the beginning of February 1990. The gap between days 380 and 470 is due to missing XBT data files. Negative distances are north (shoreward) of the axis, as in figure 4.

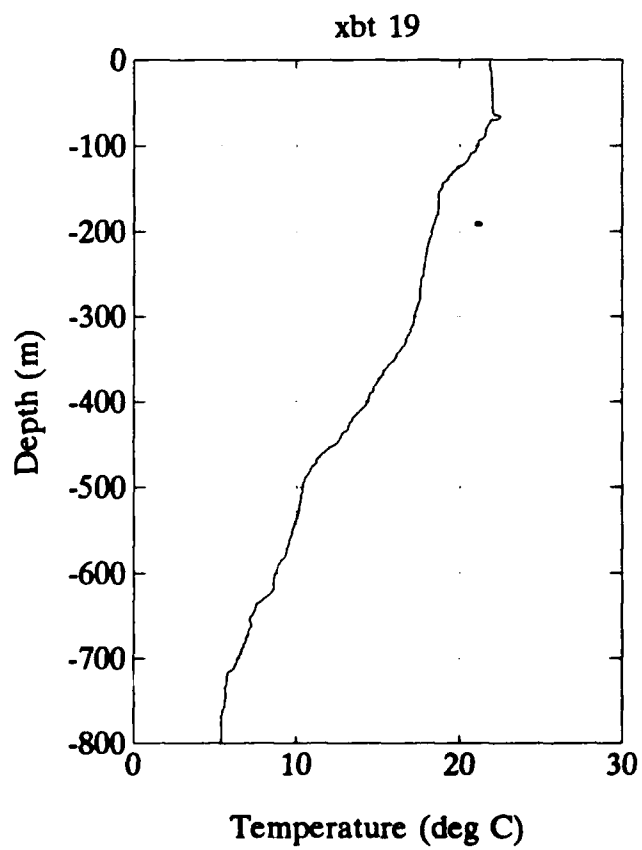
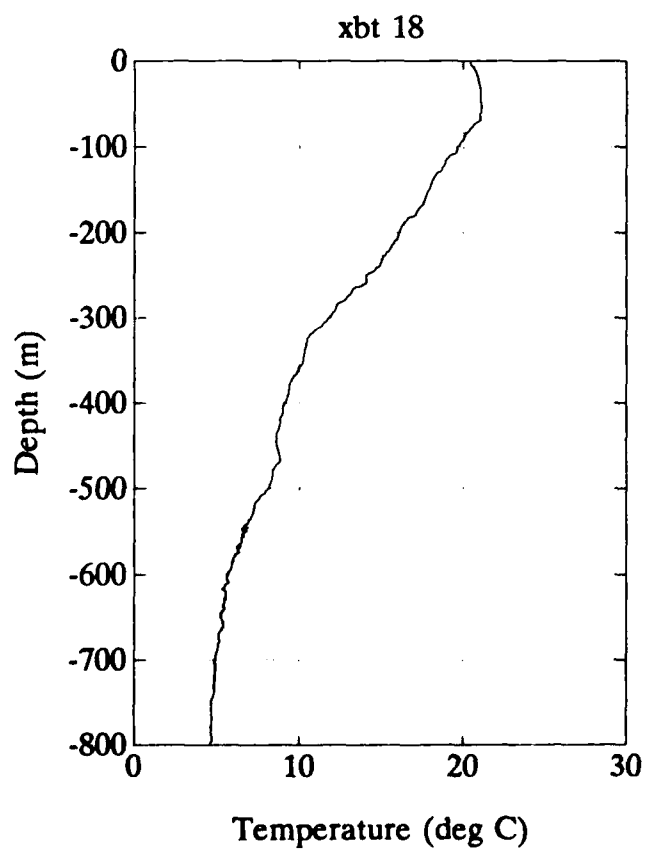
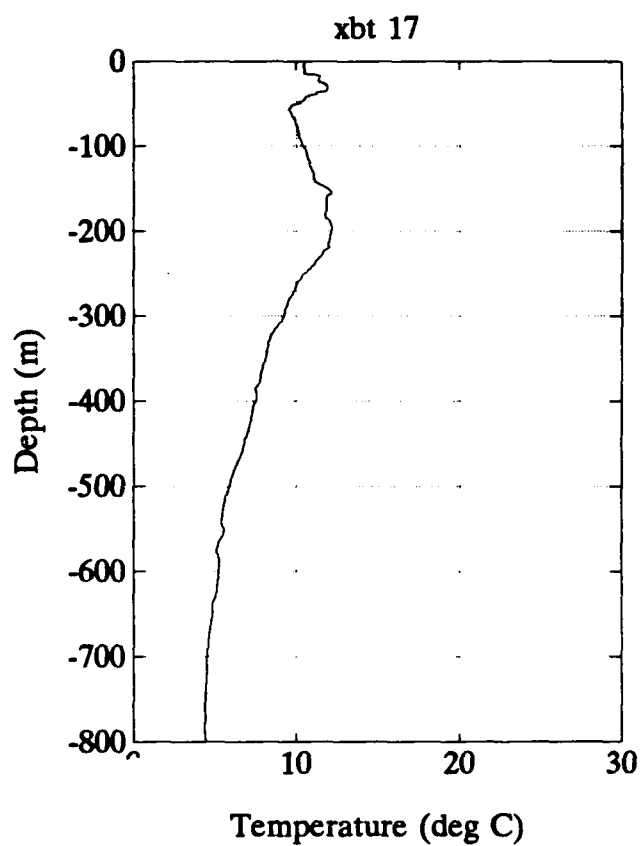
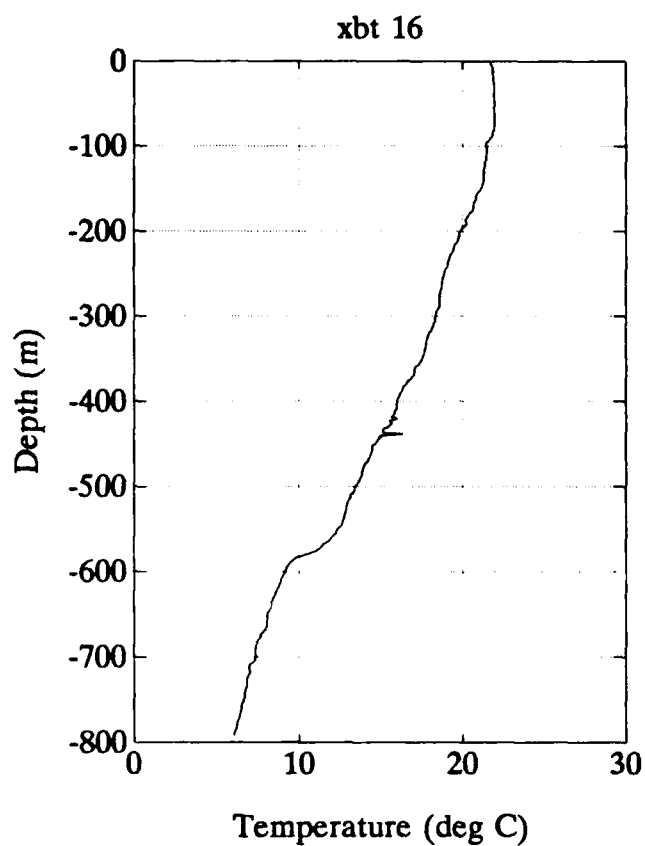
## **6. XBT Data**

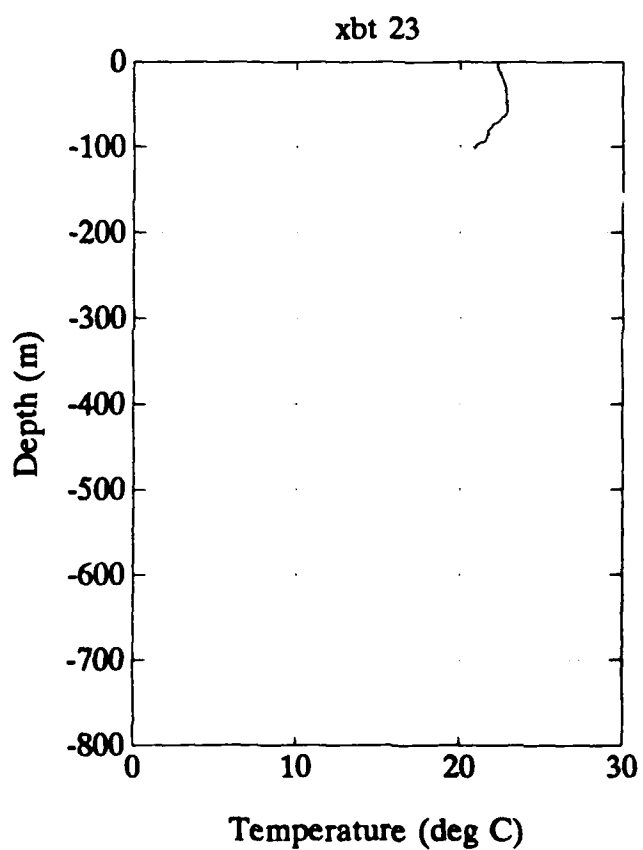
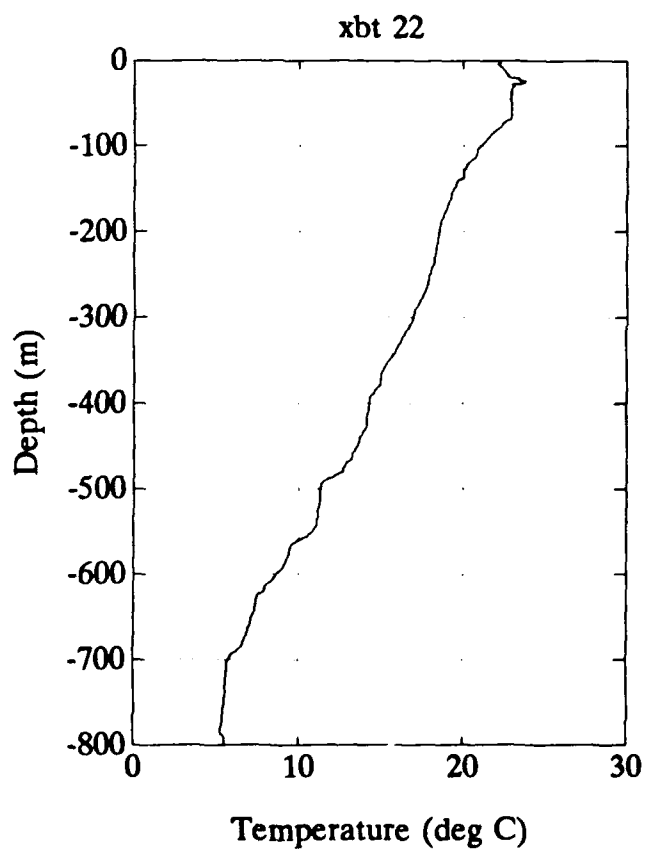
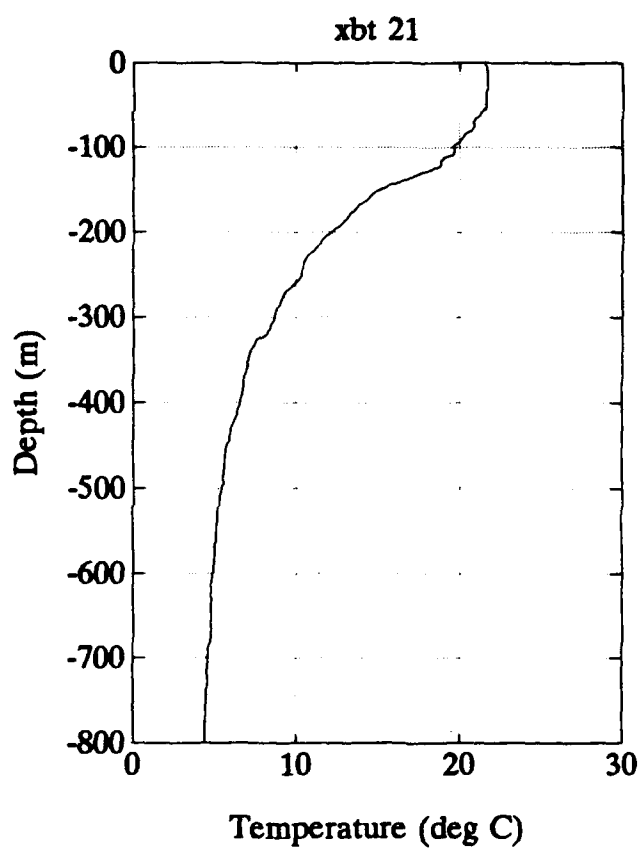
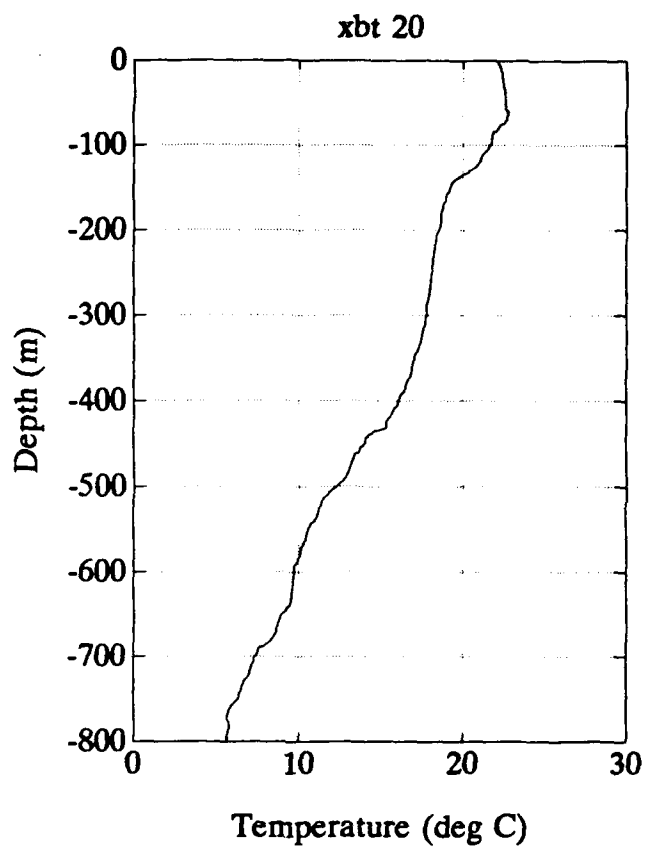


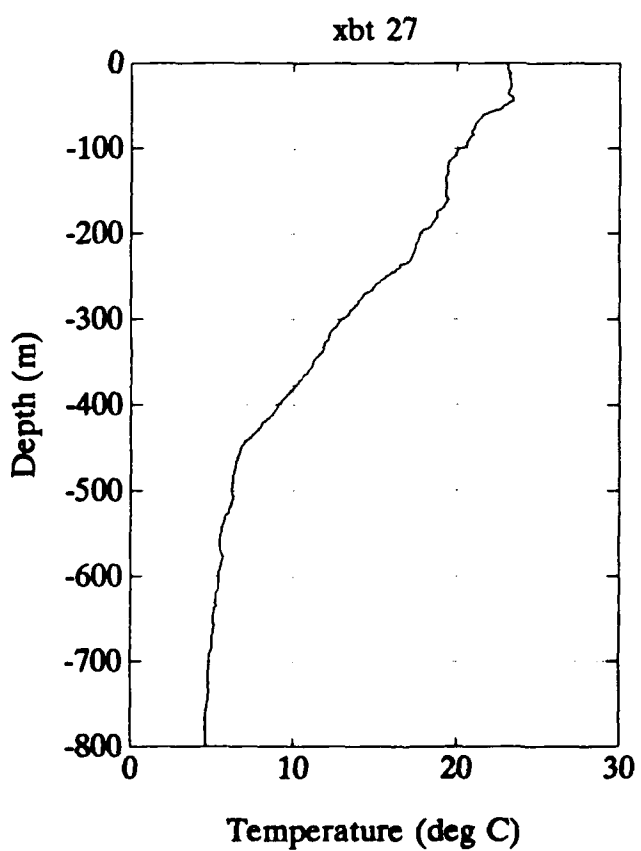
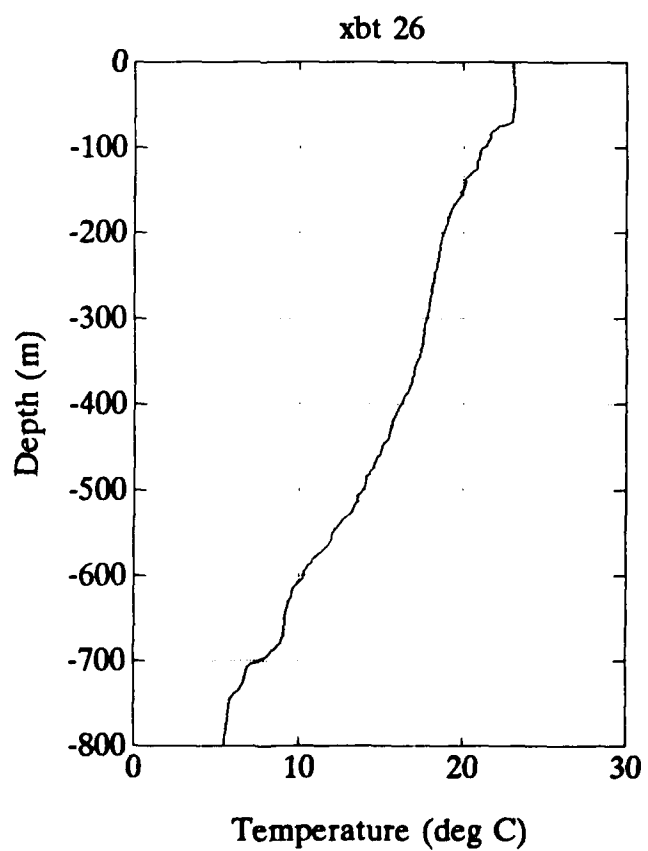
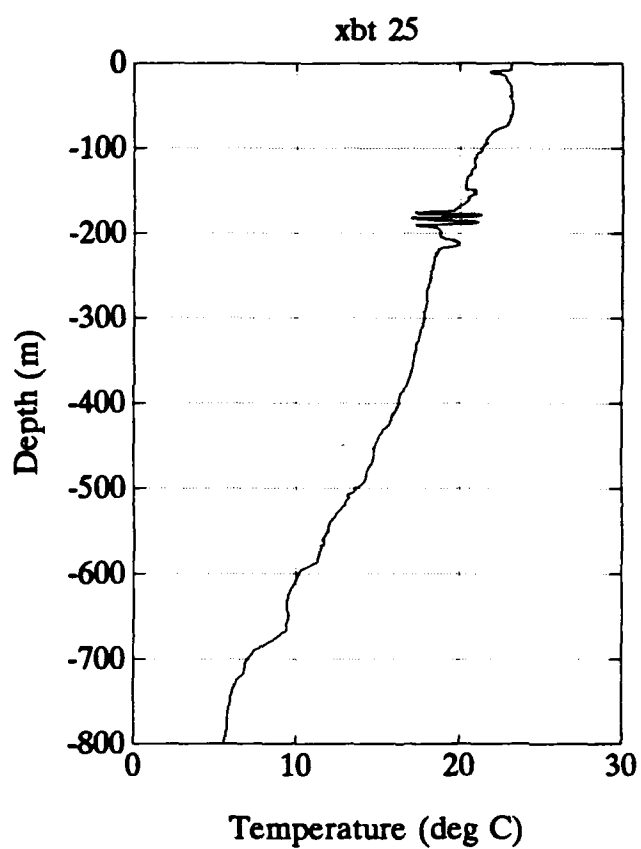
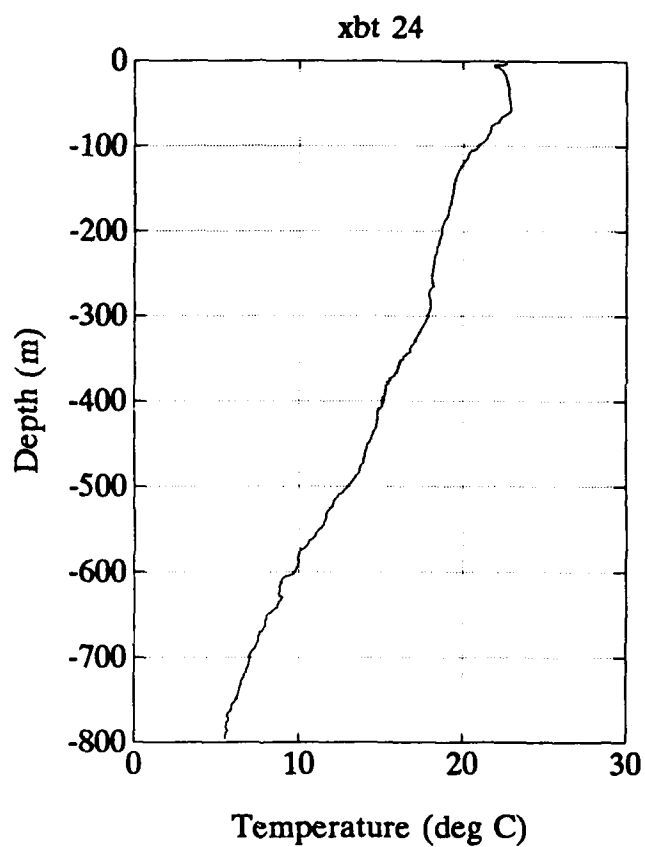


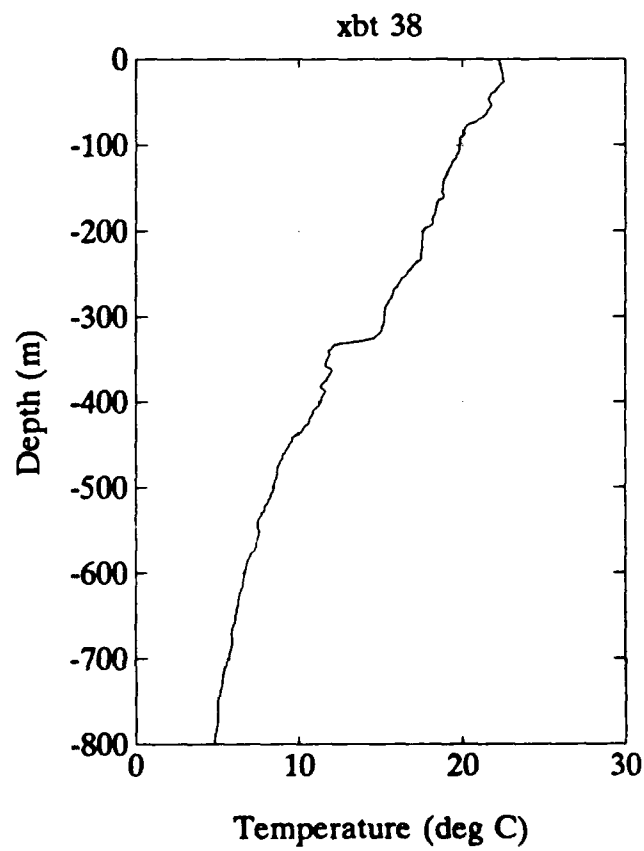
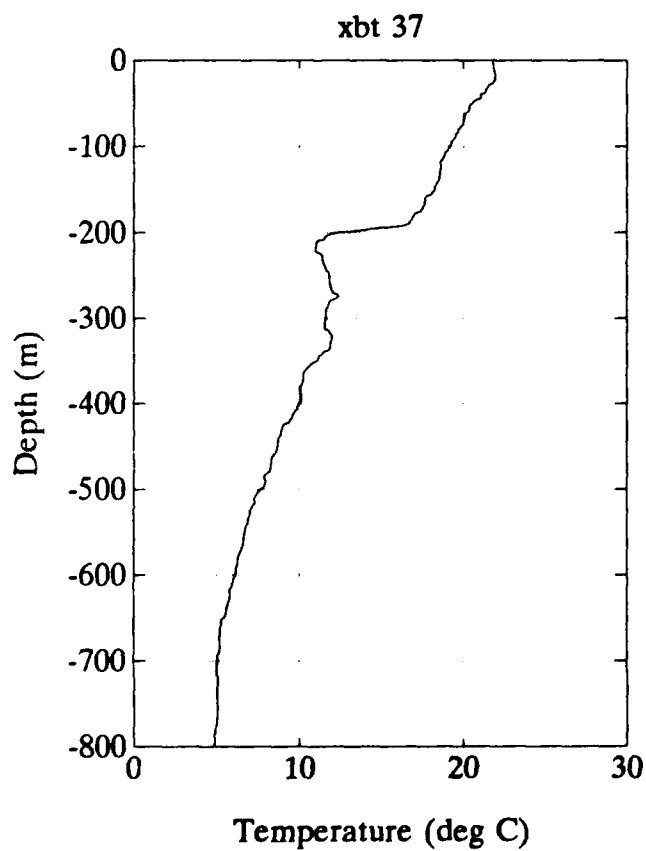
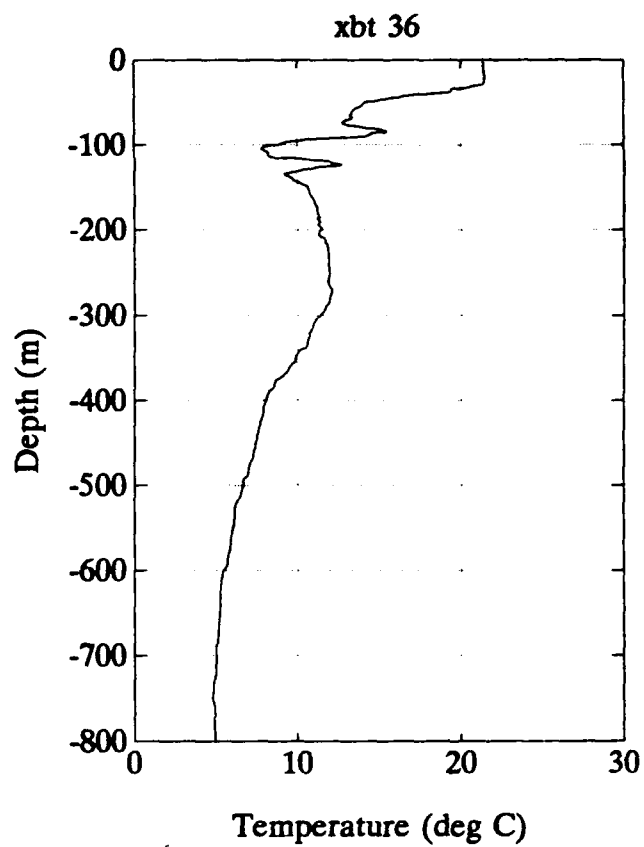
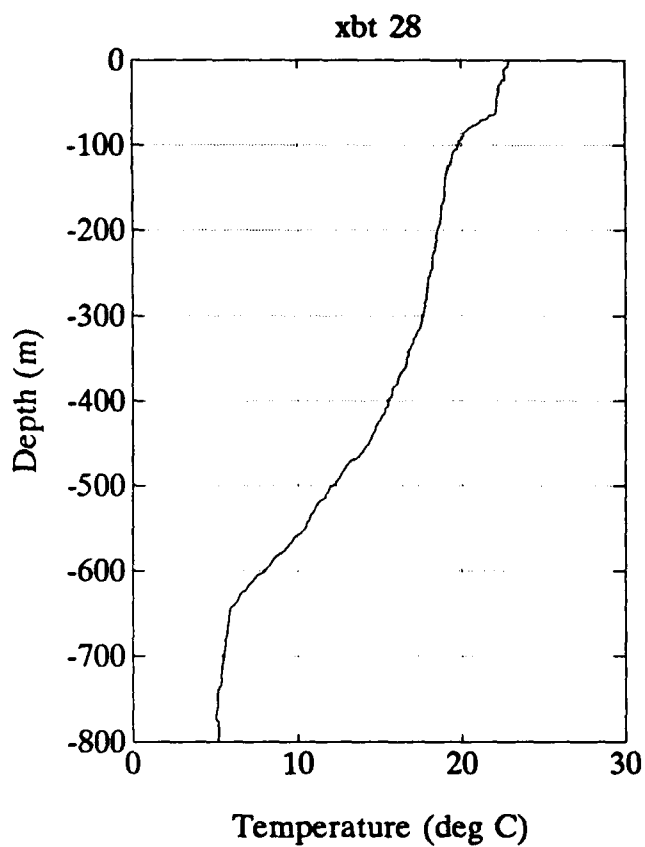


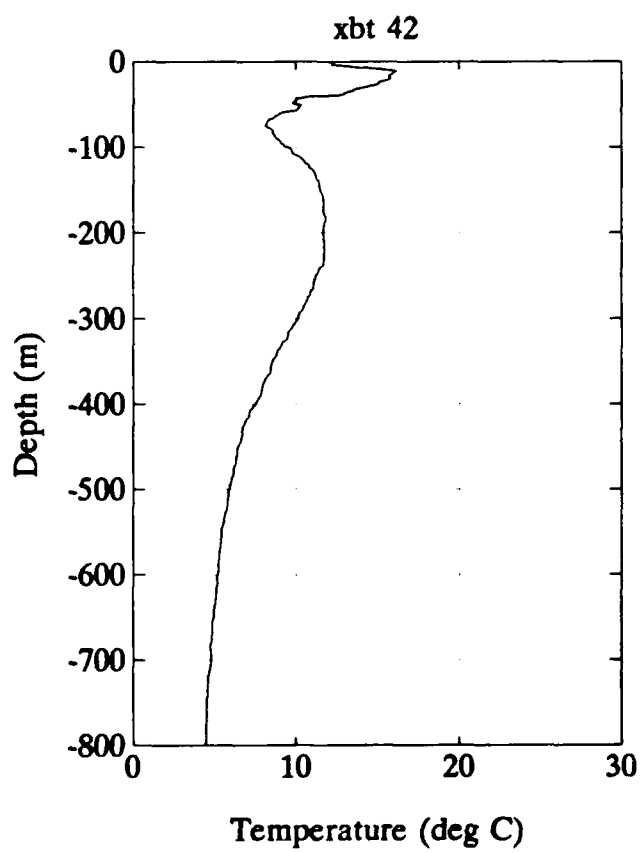
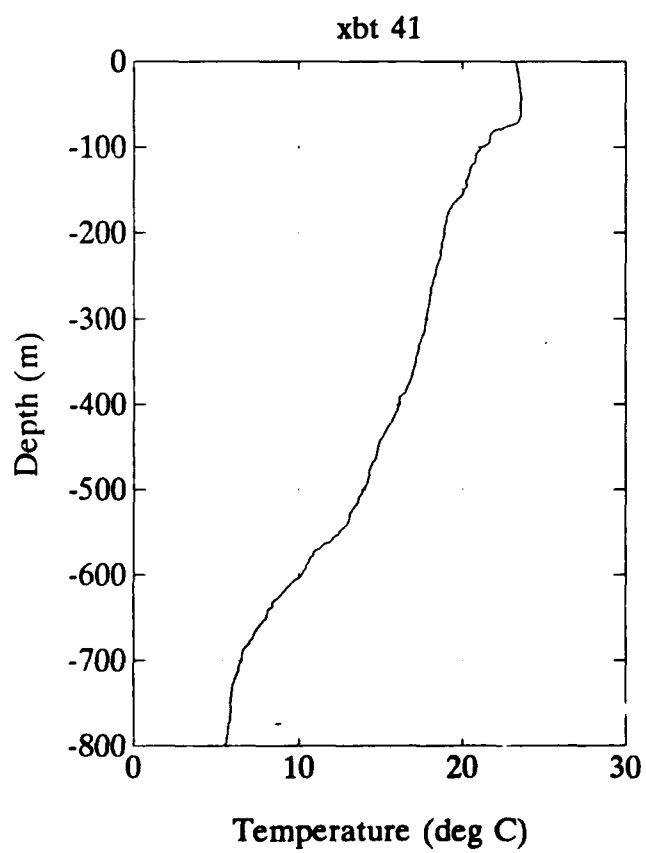
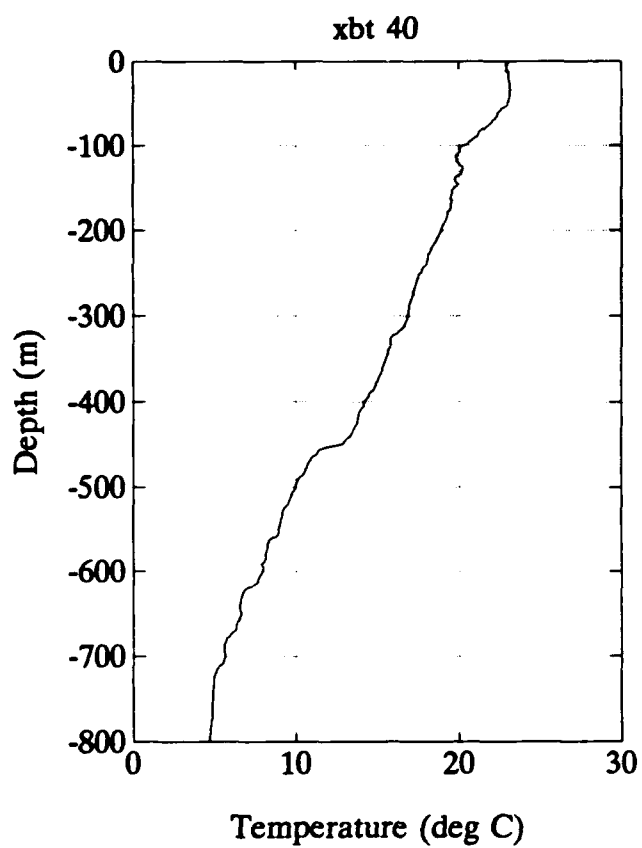
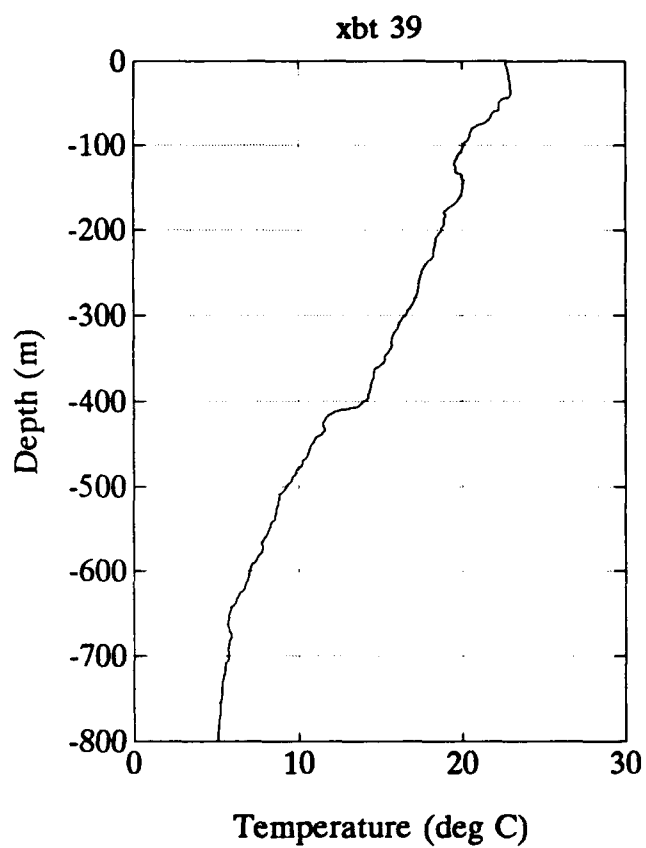


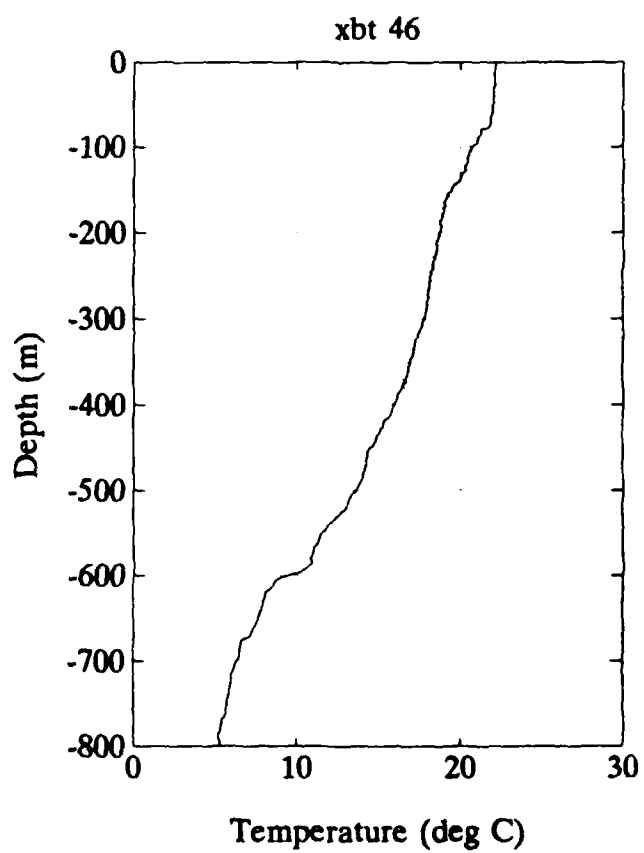
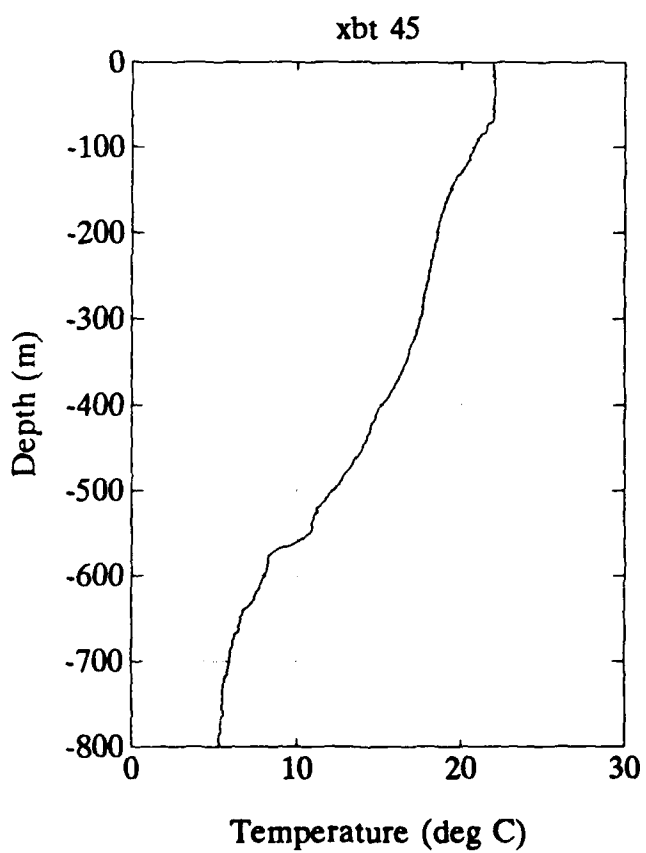
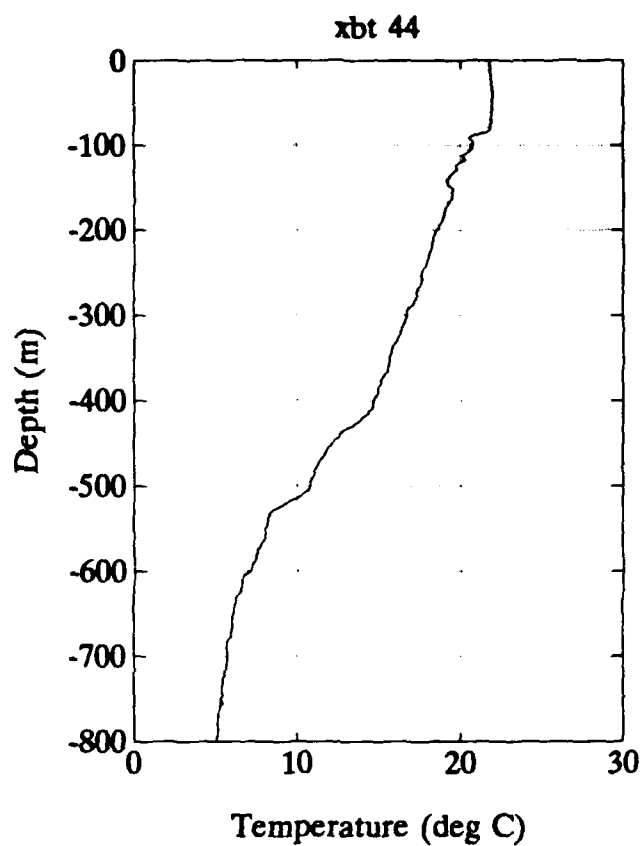
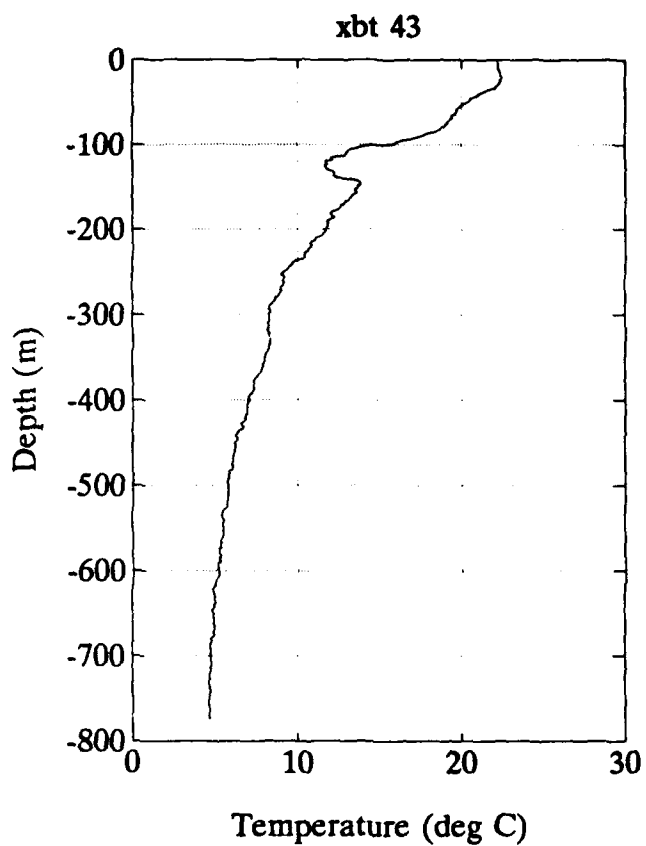




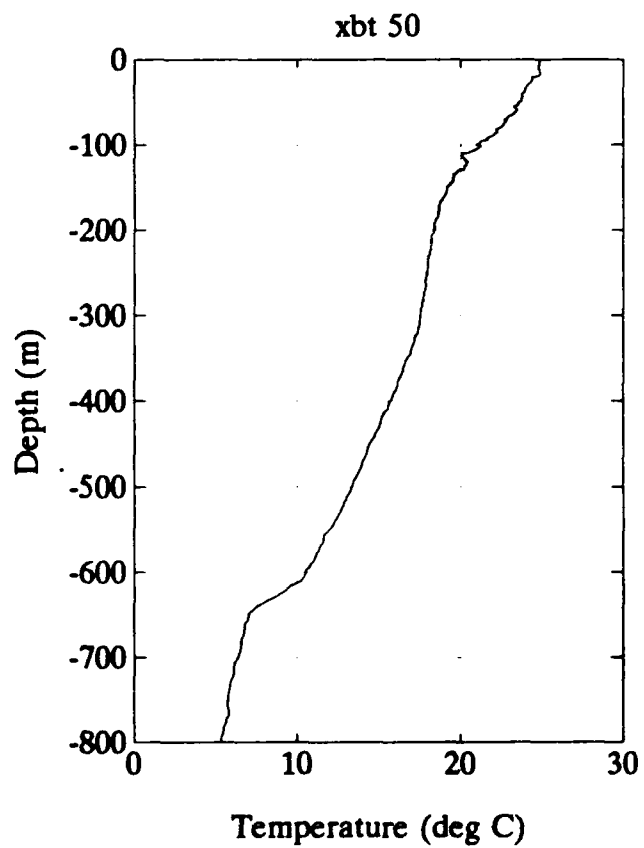
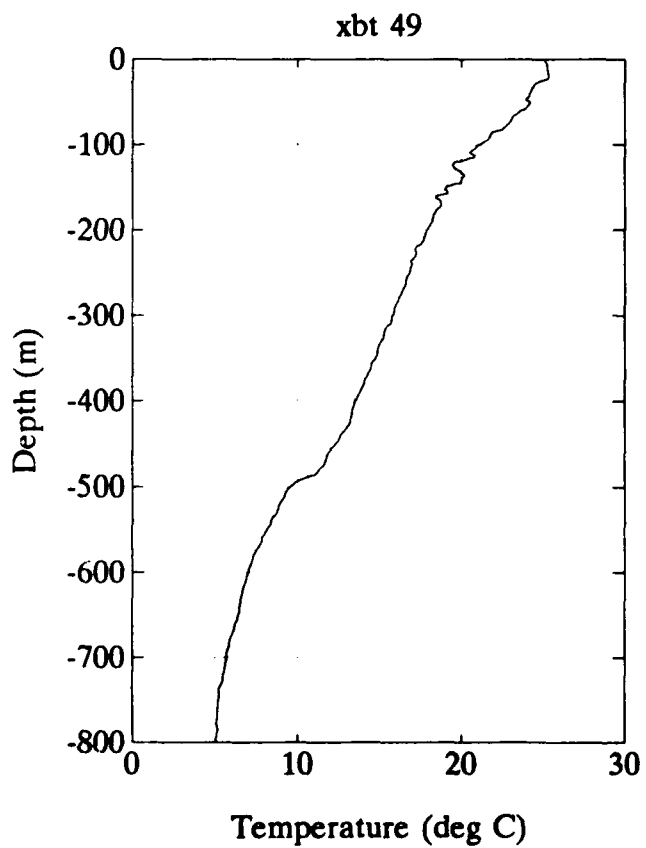
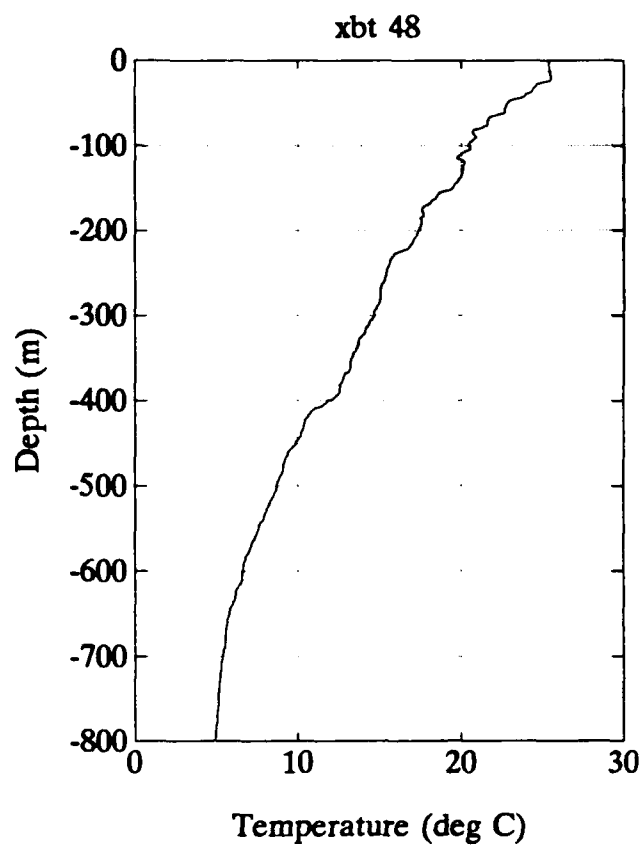
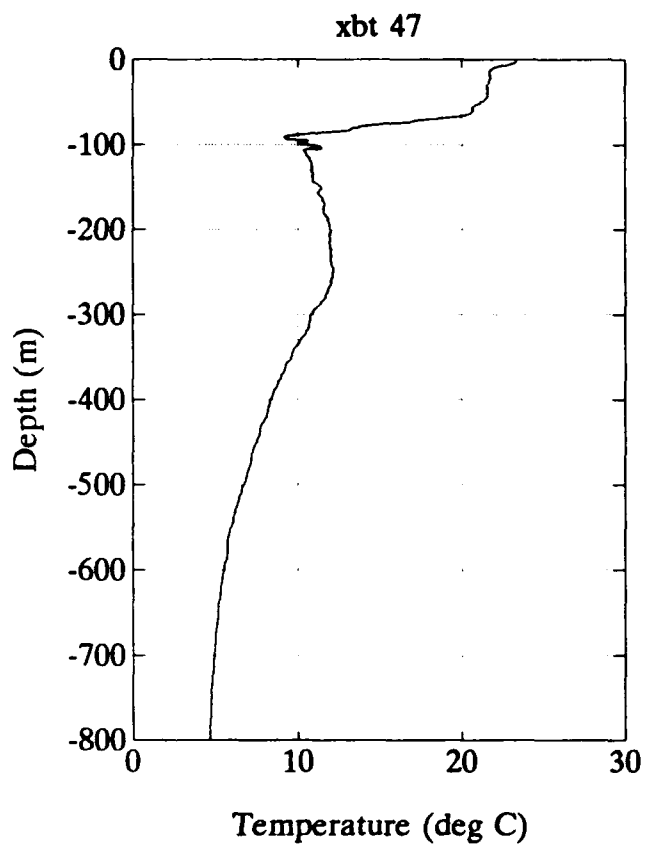


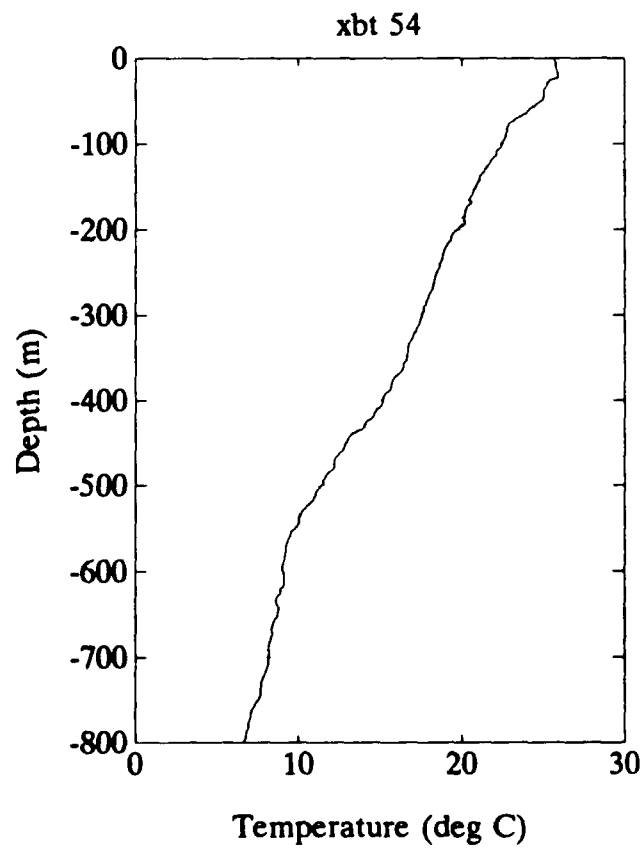
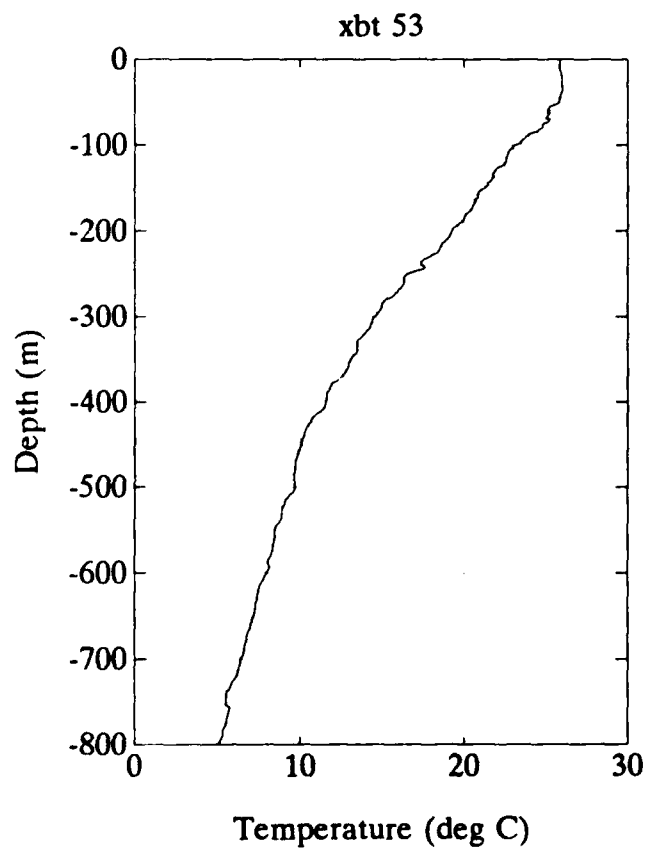
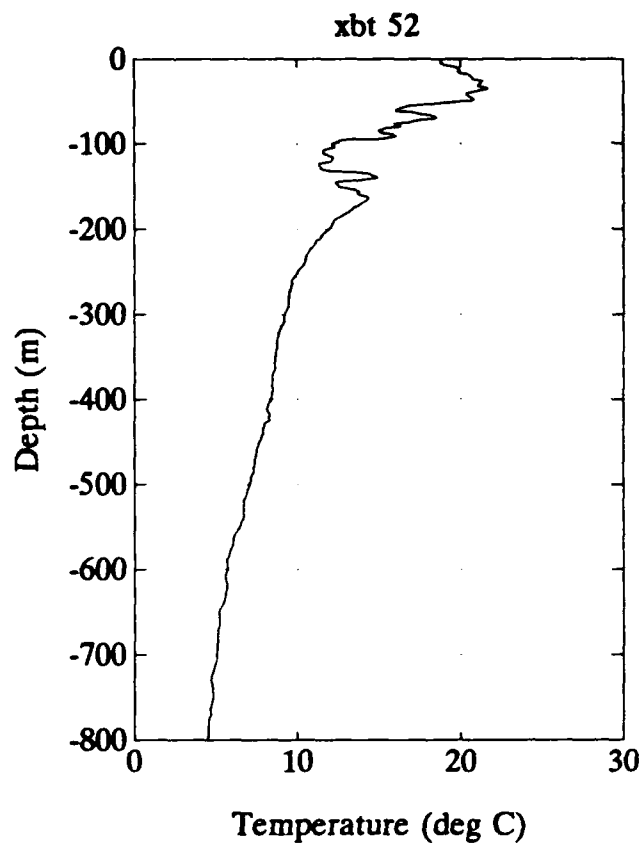
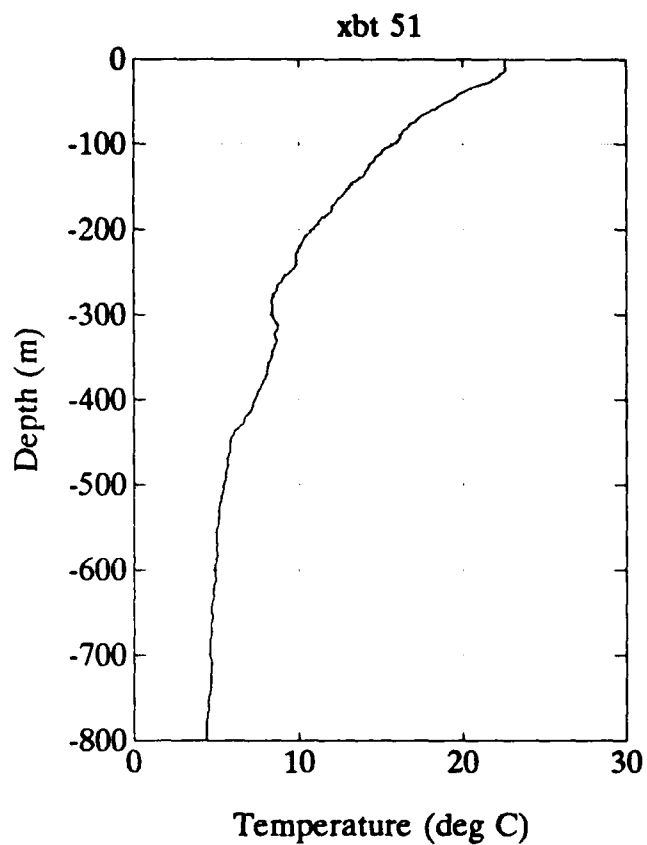


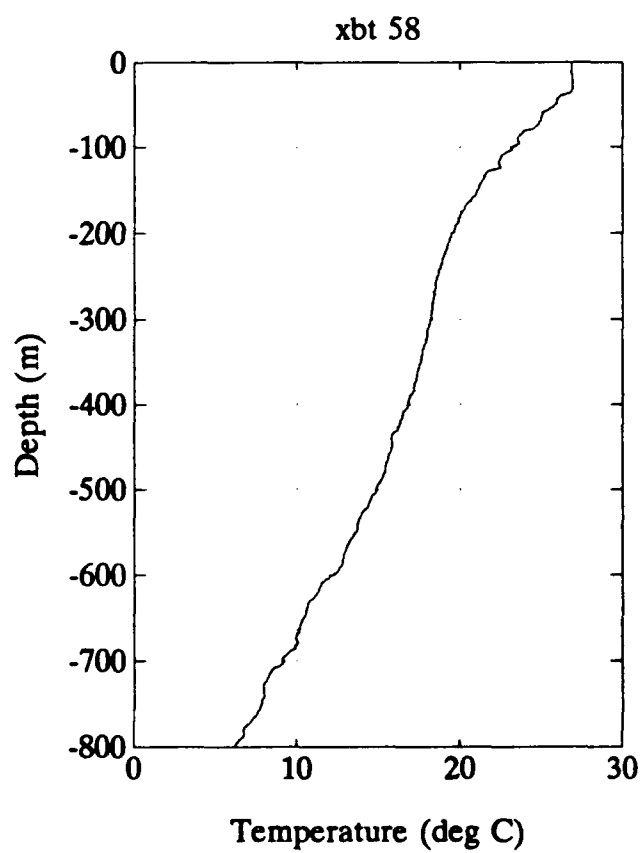
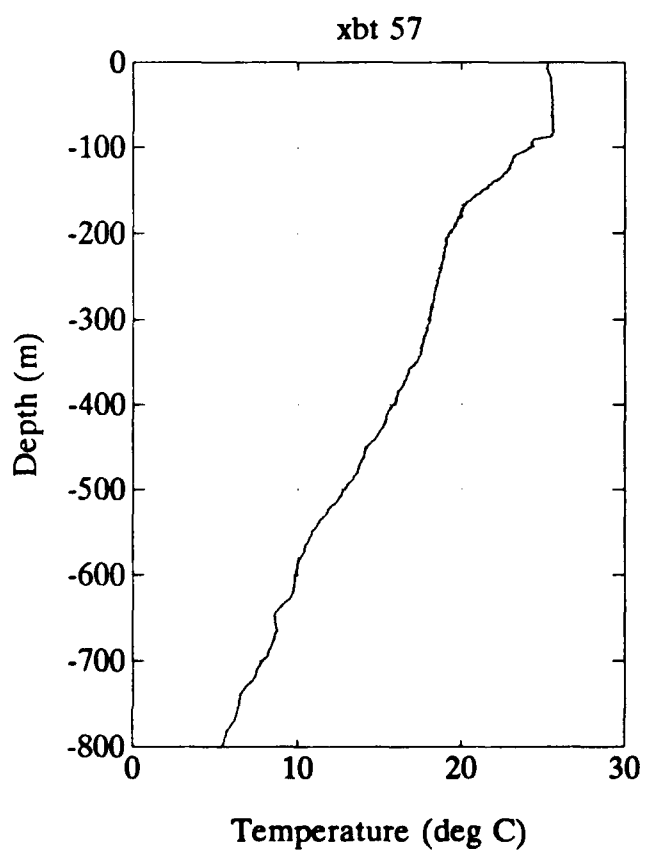
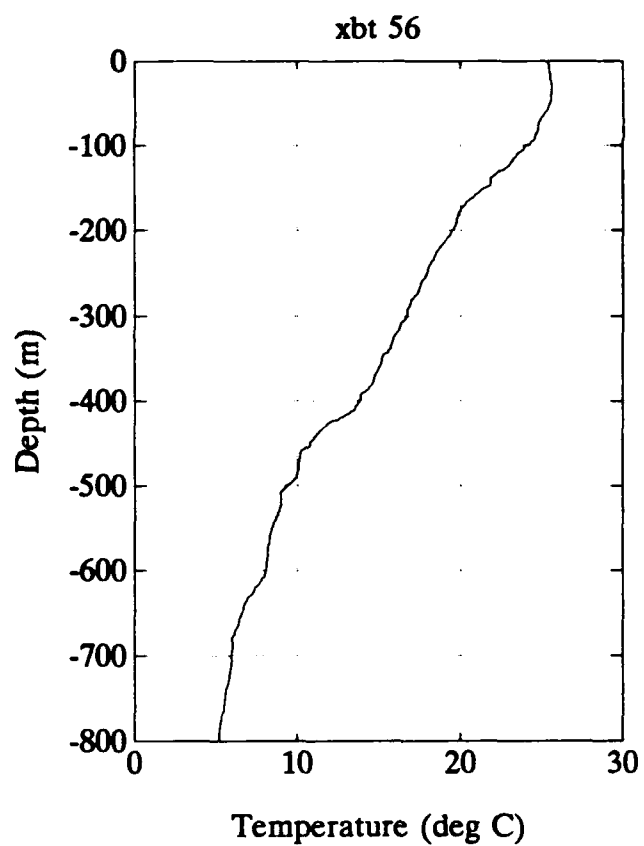
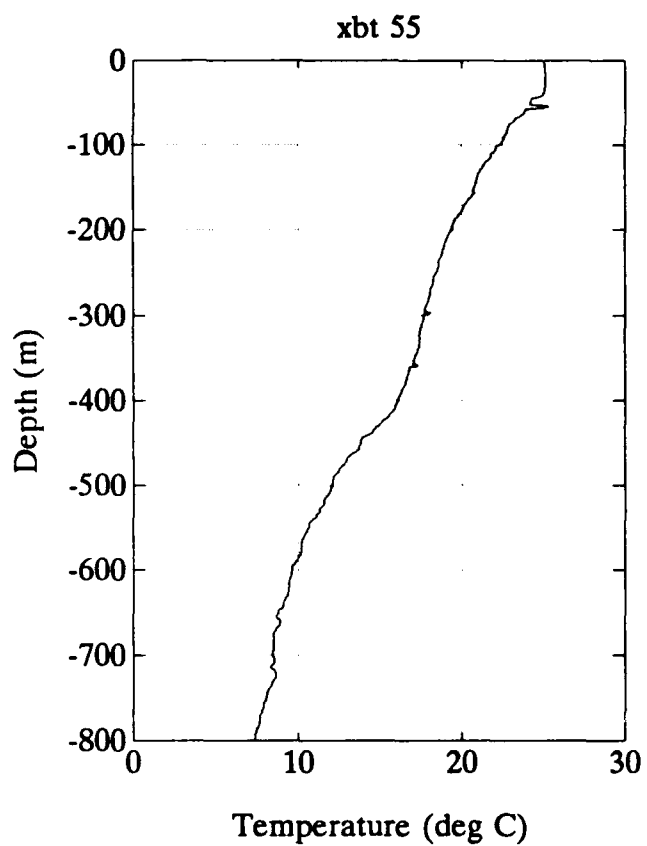


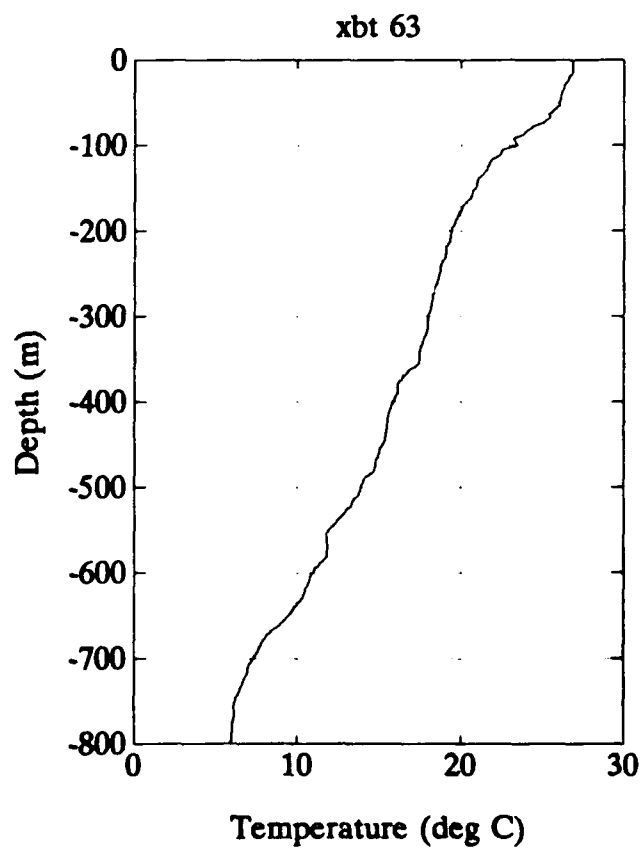
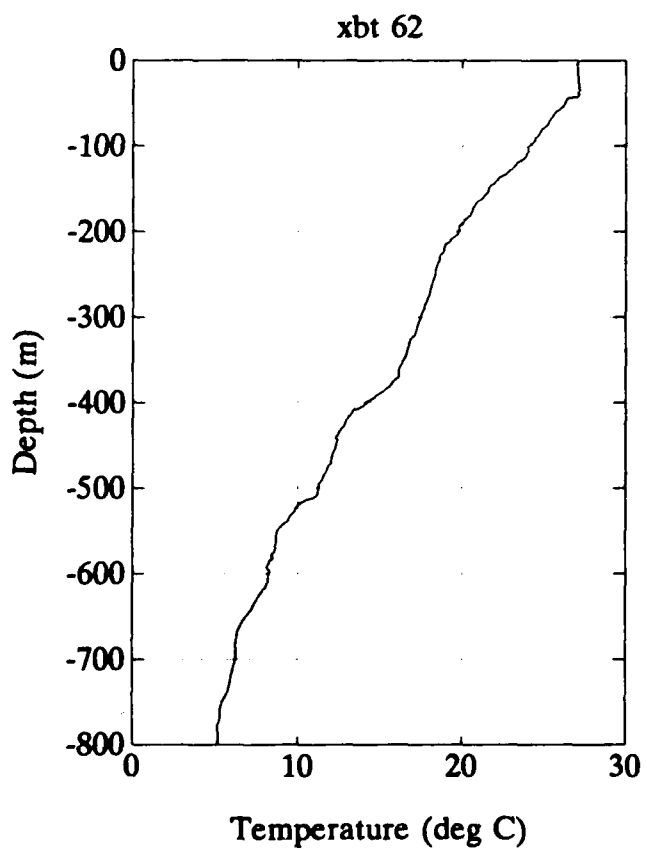
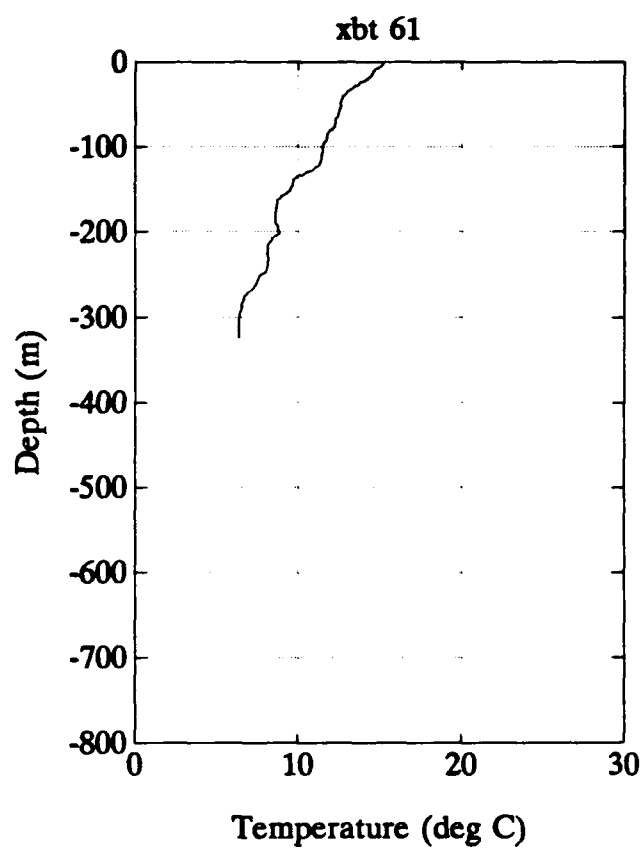
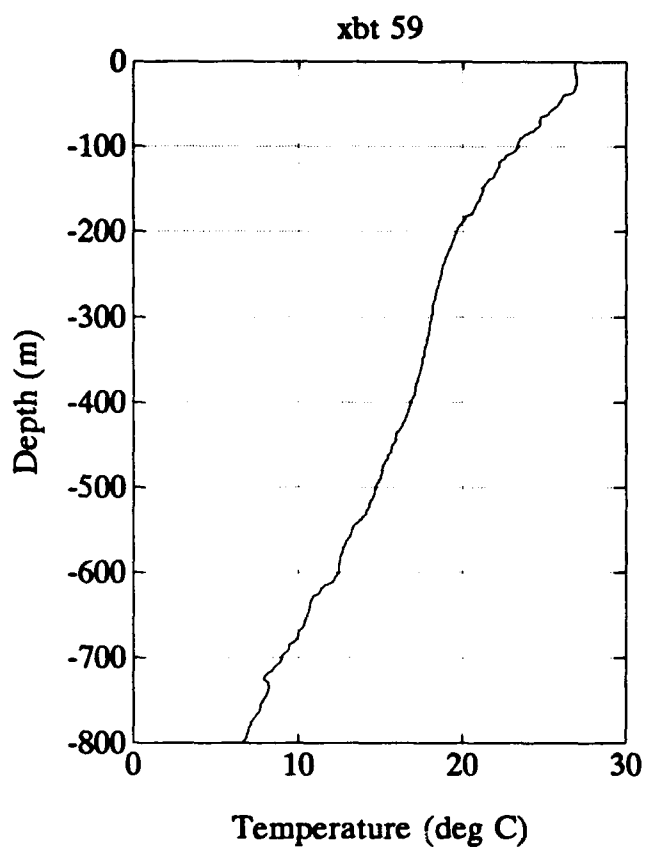


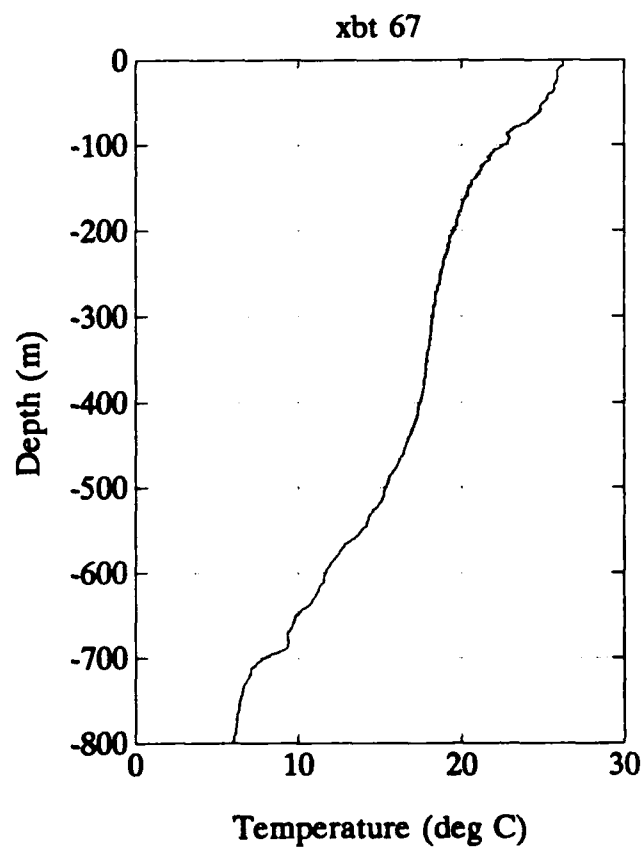
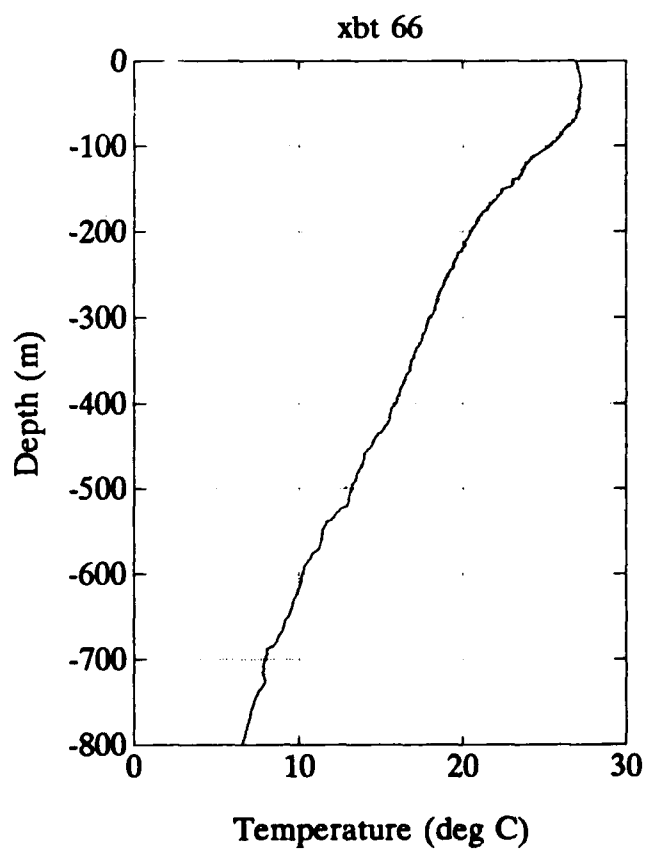
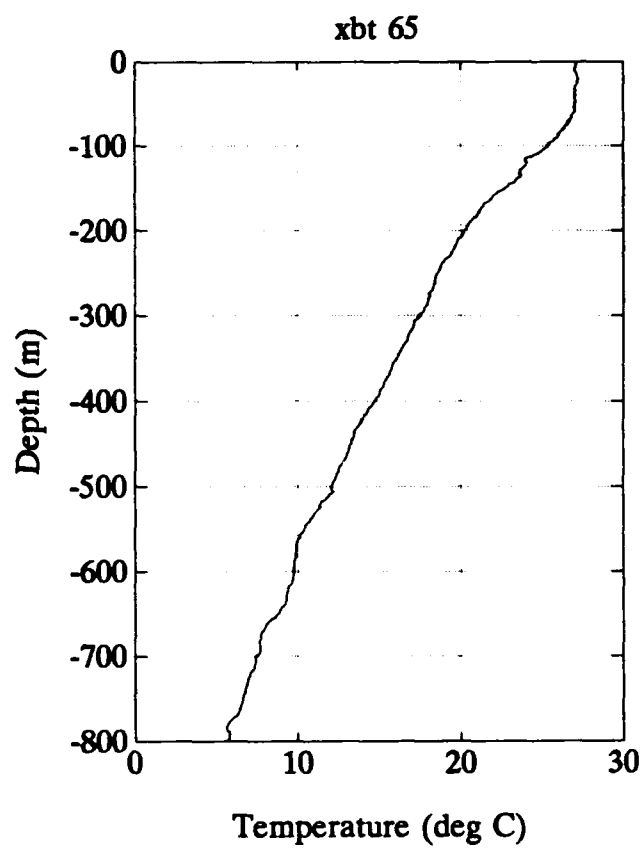
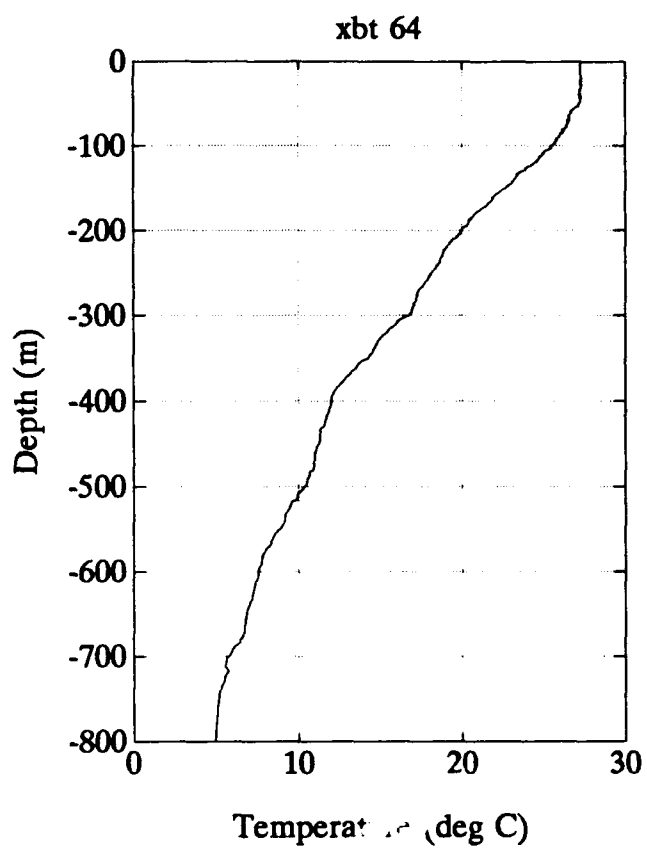


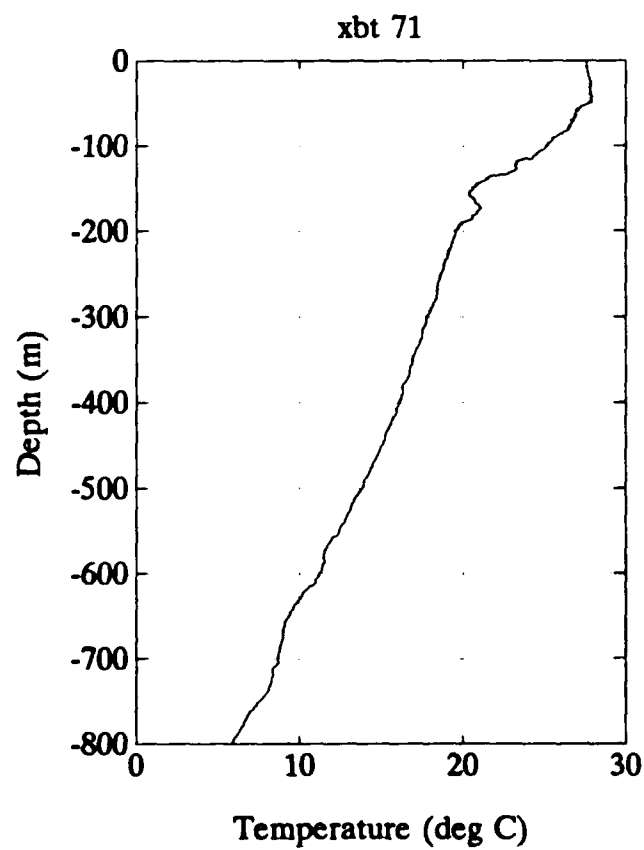
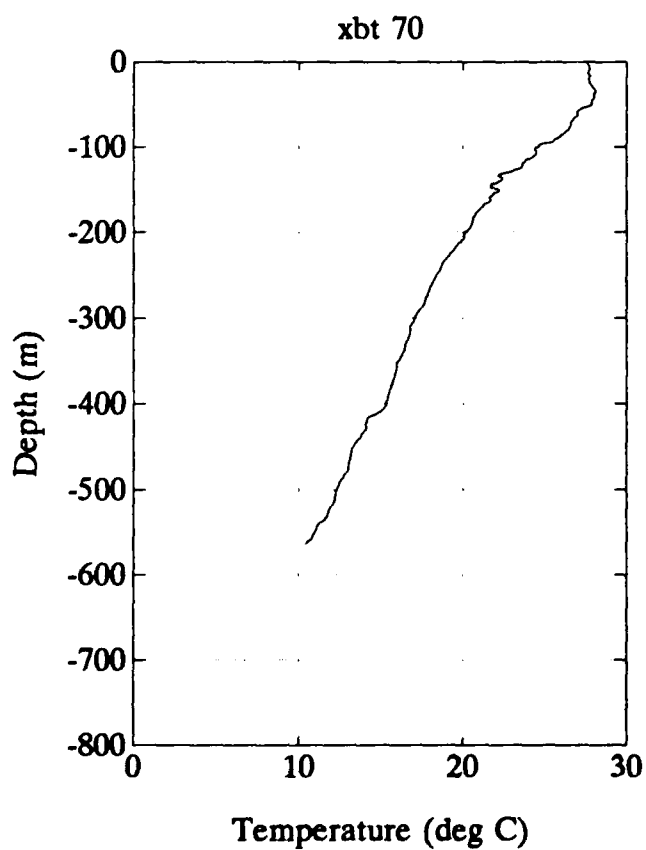
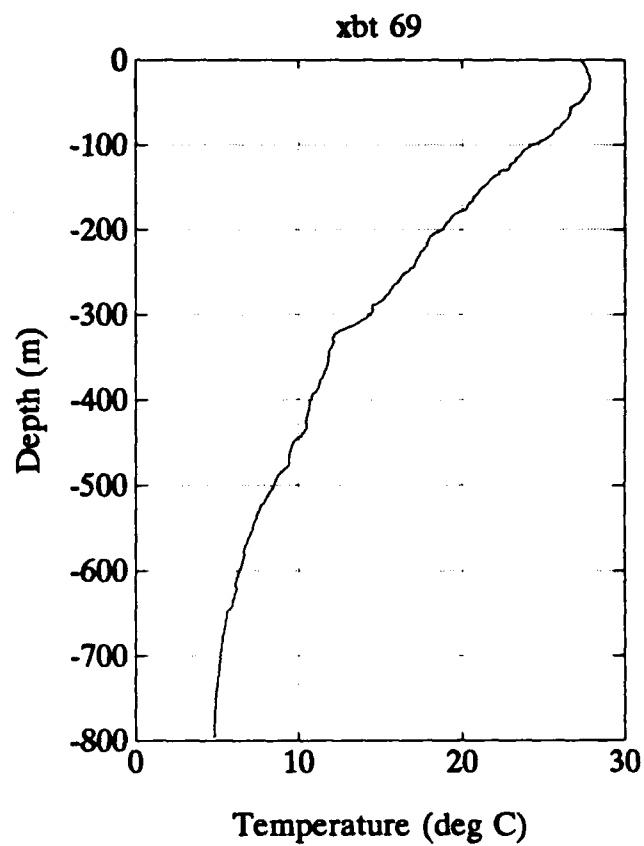
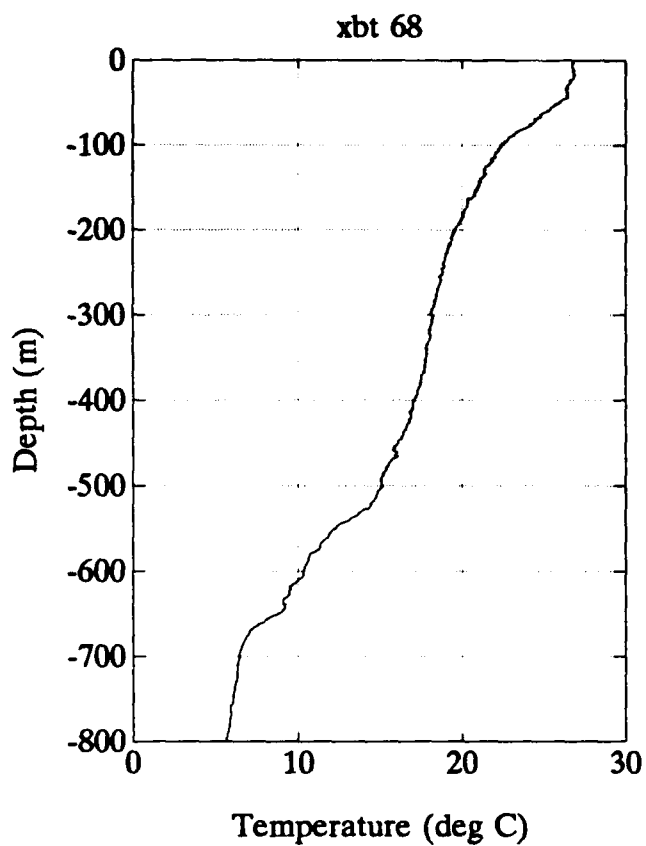


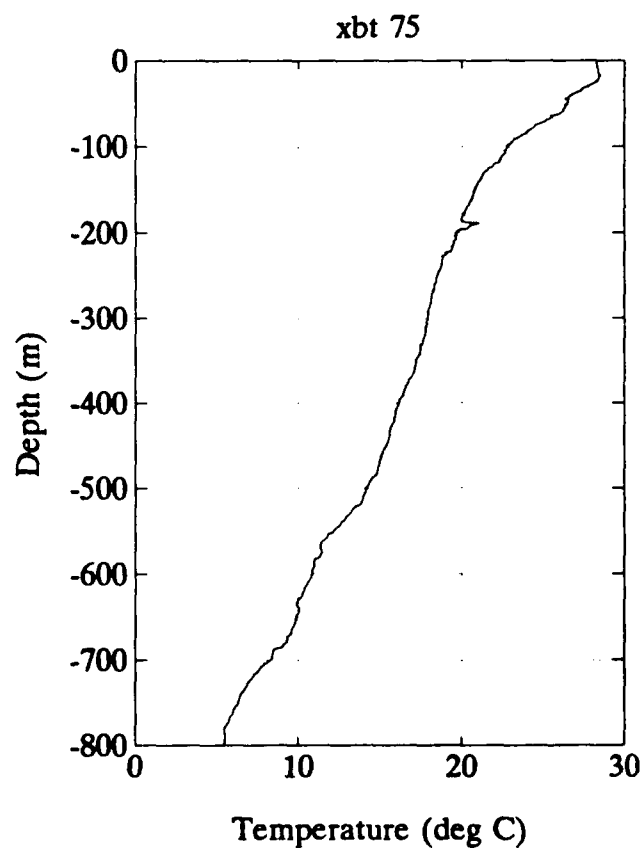
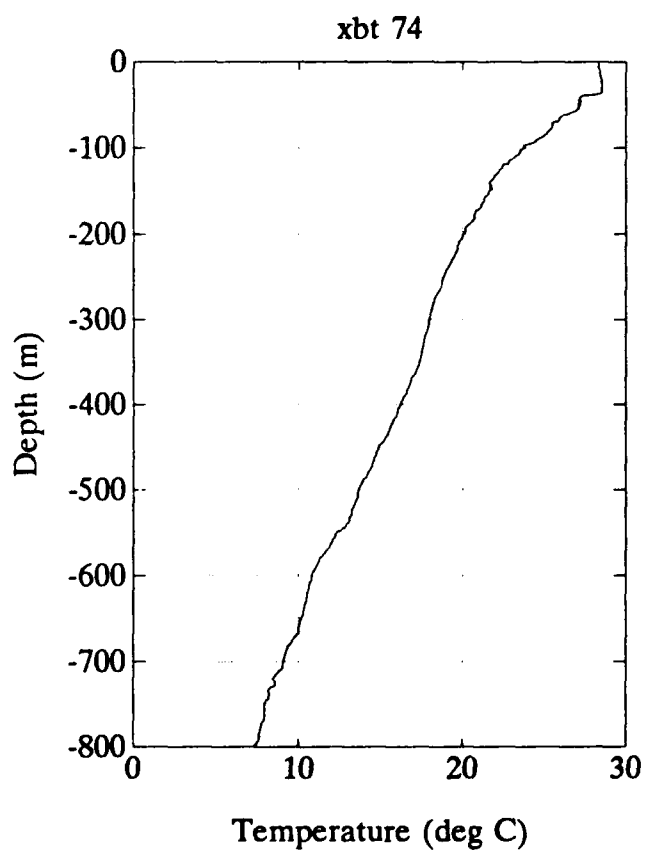
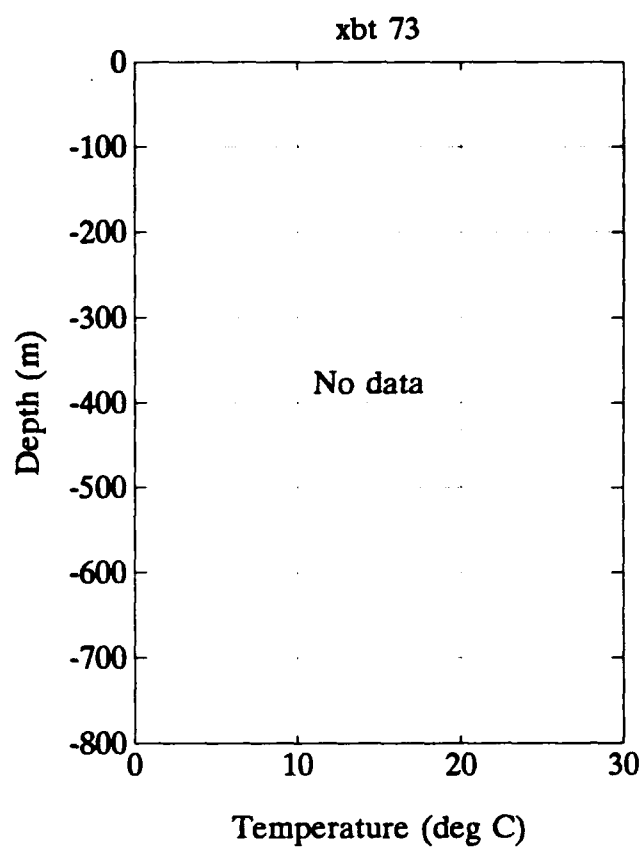
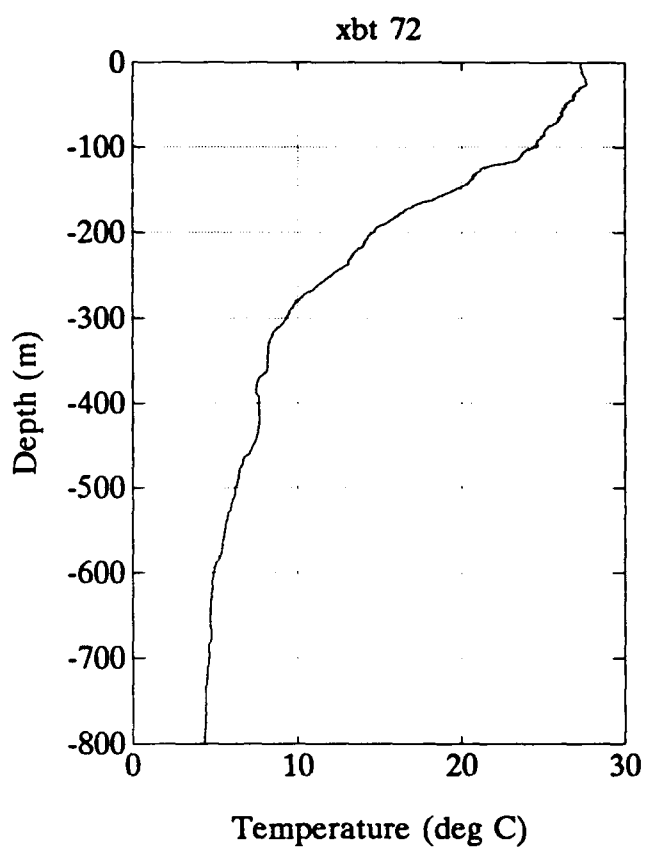


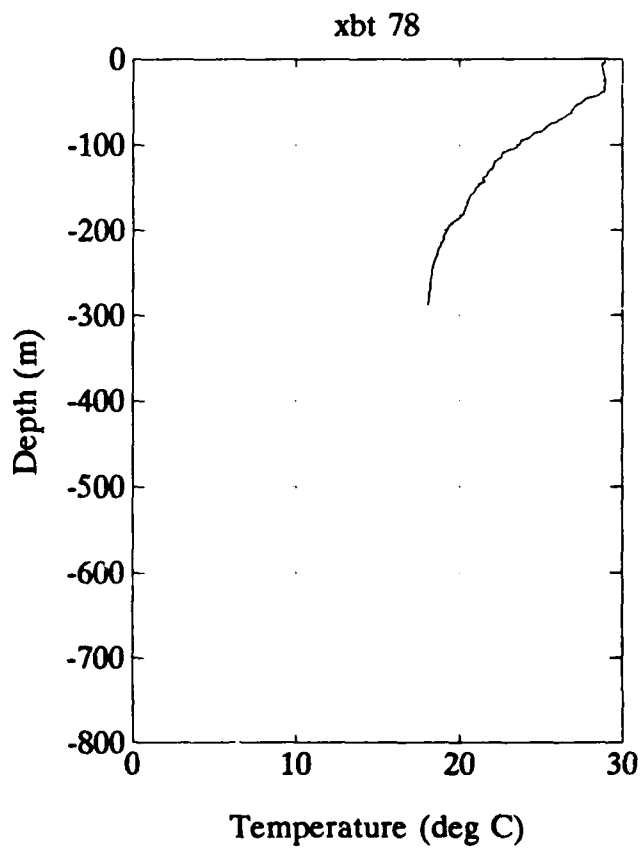
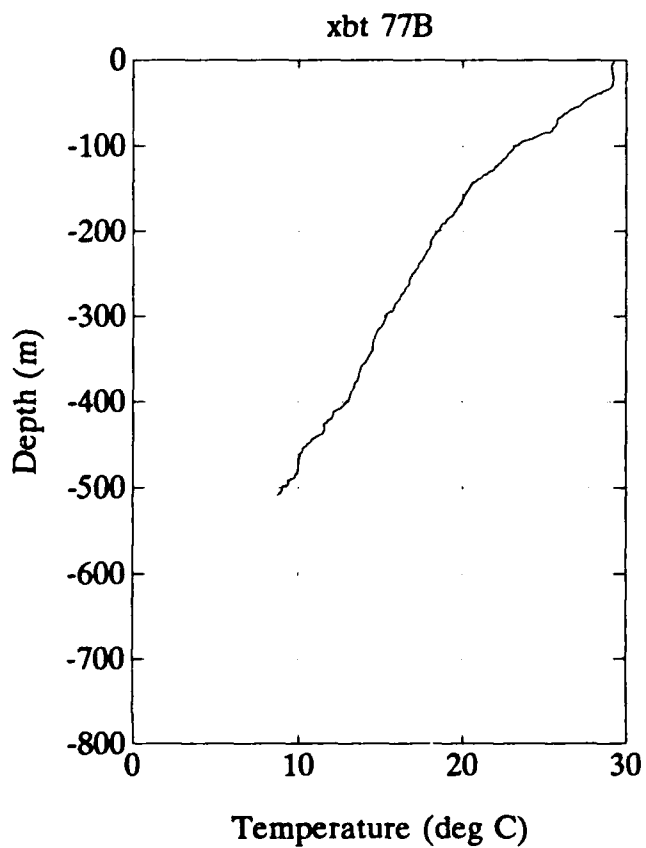
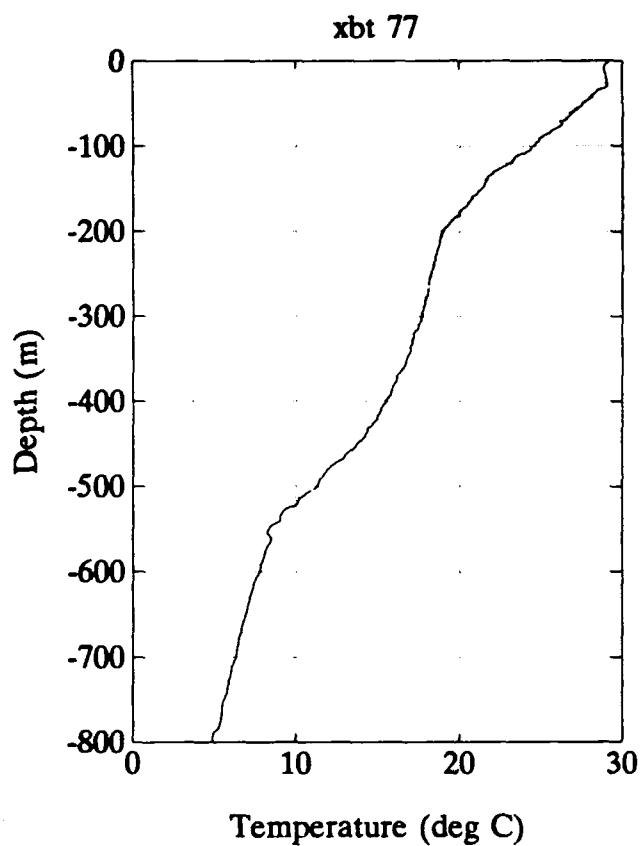
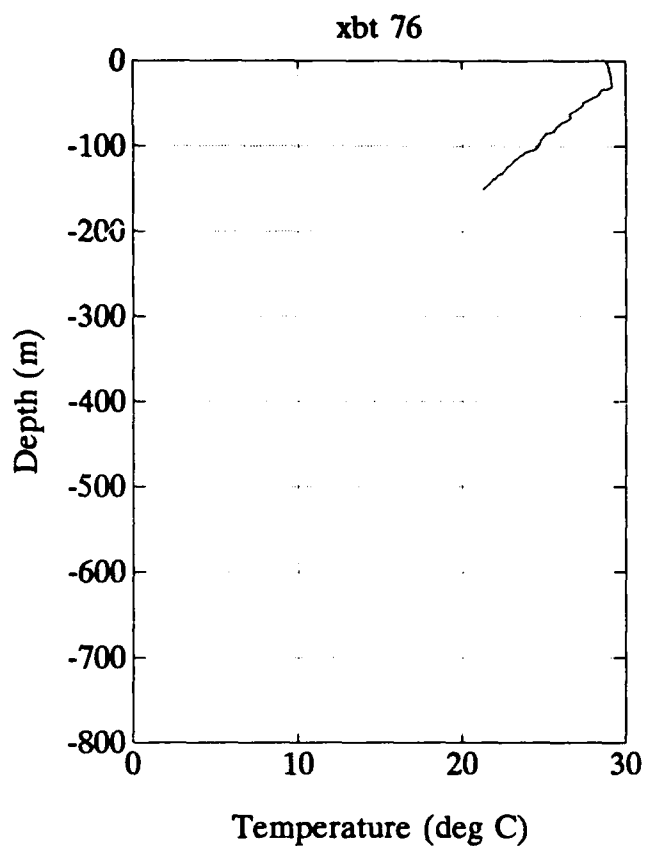




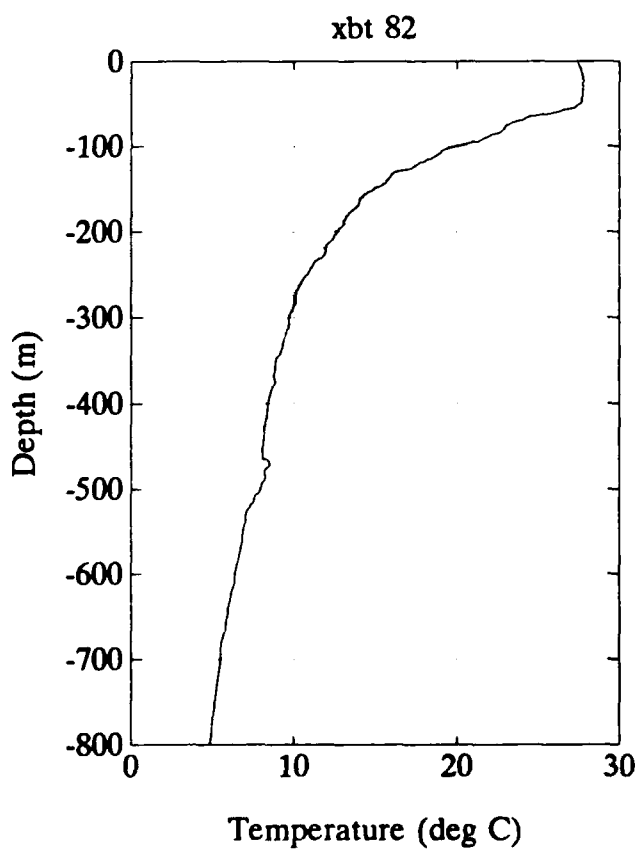
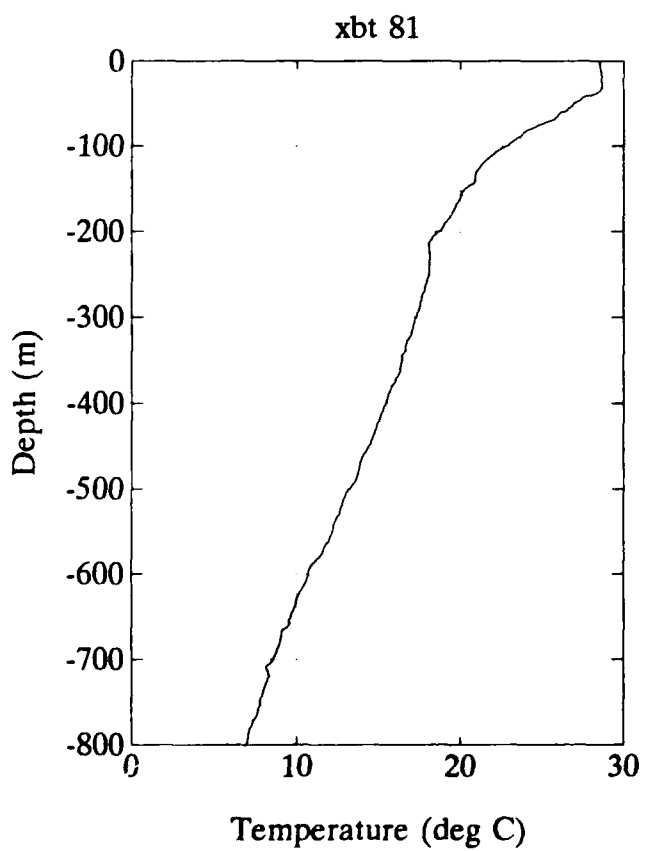
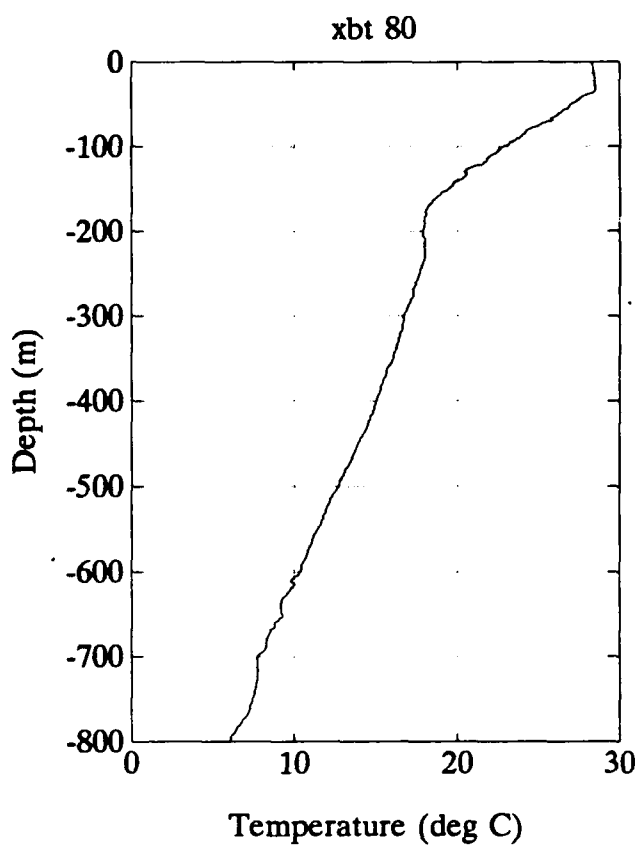
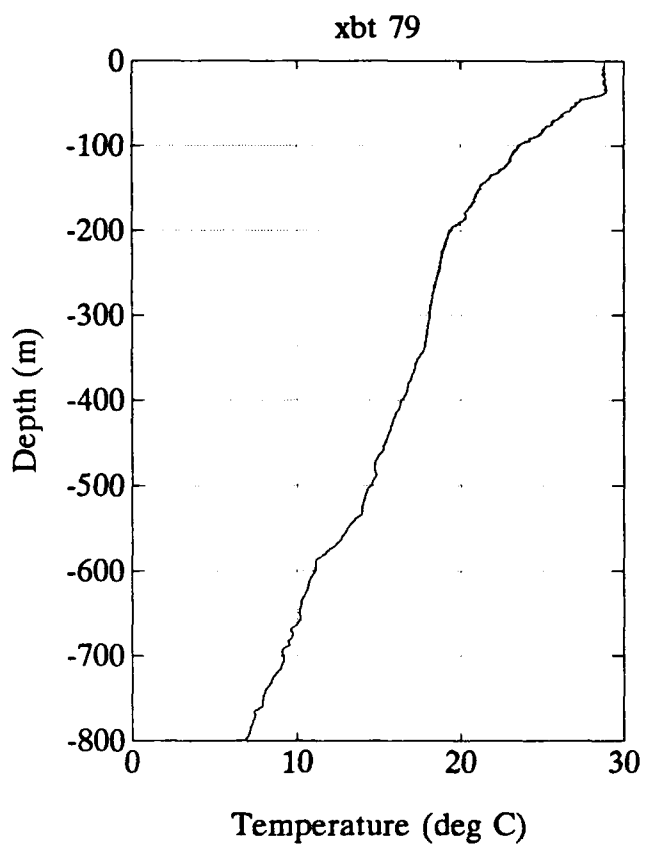


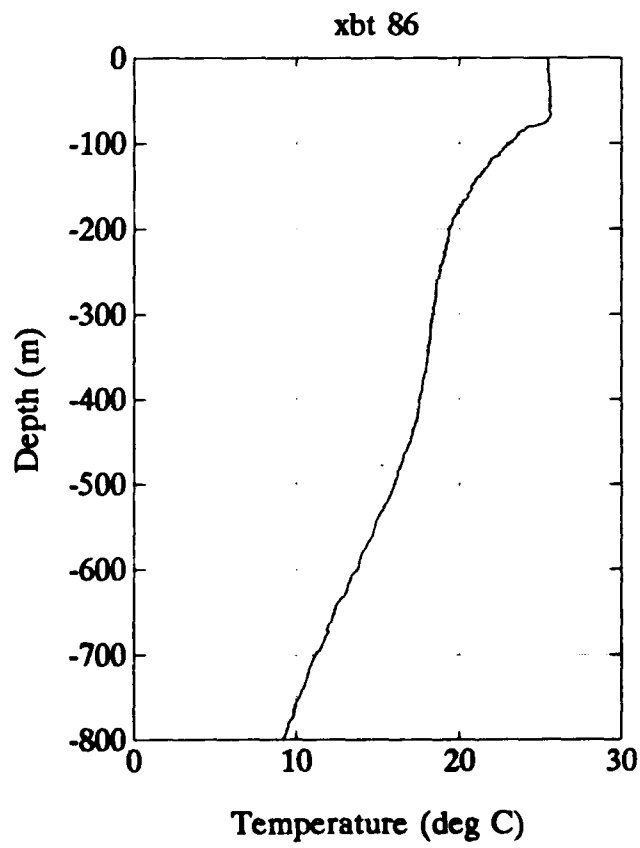
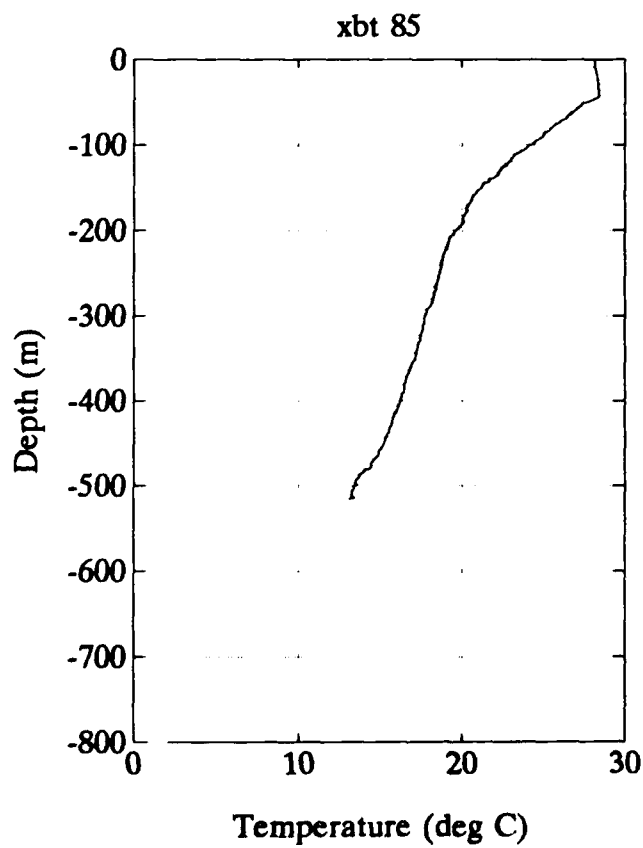
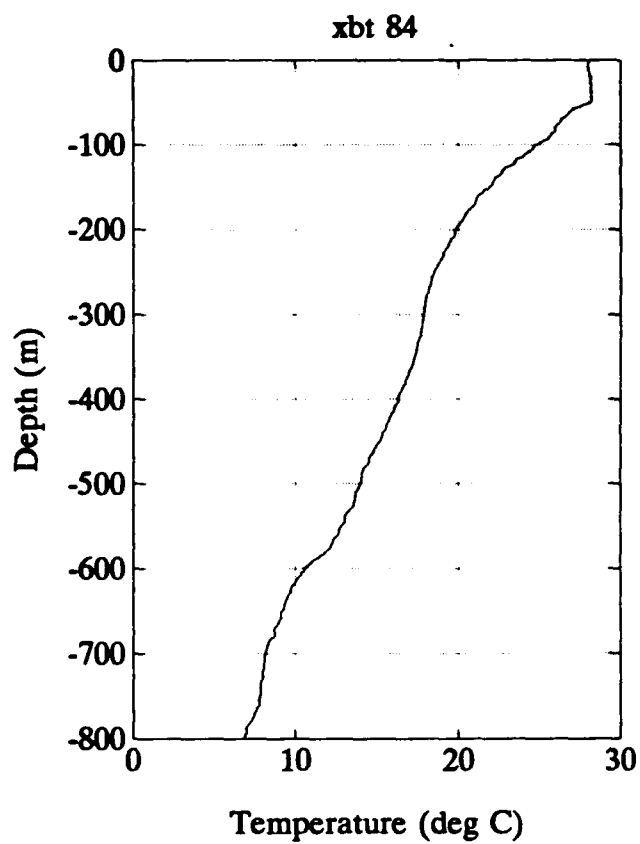
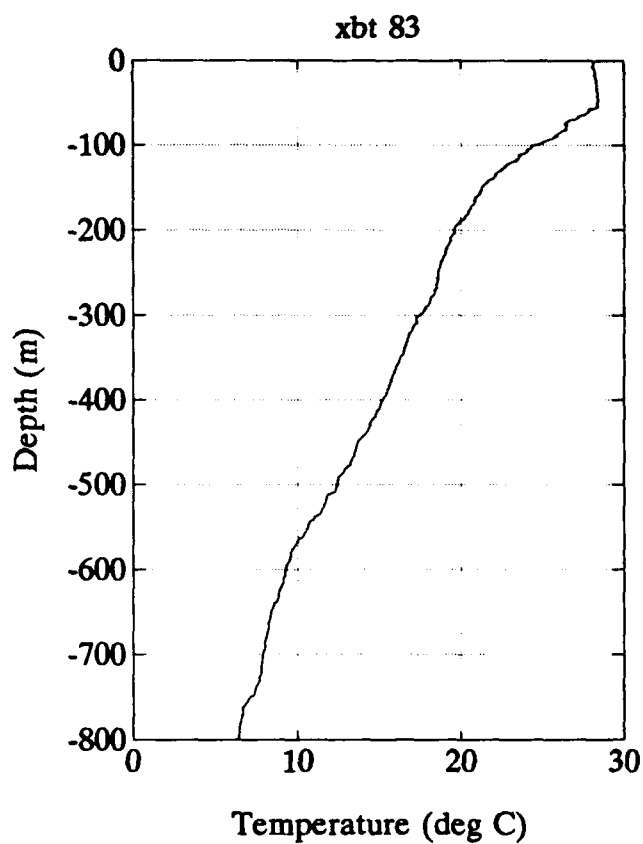


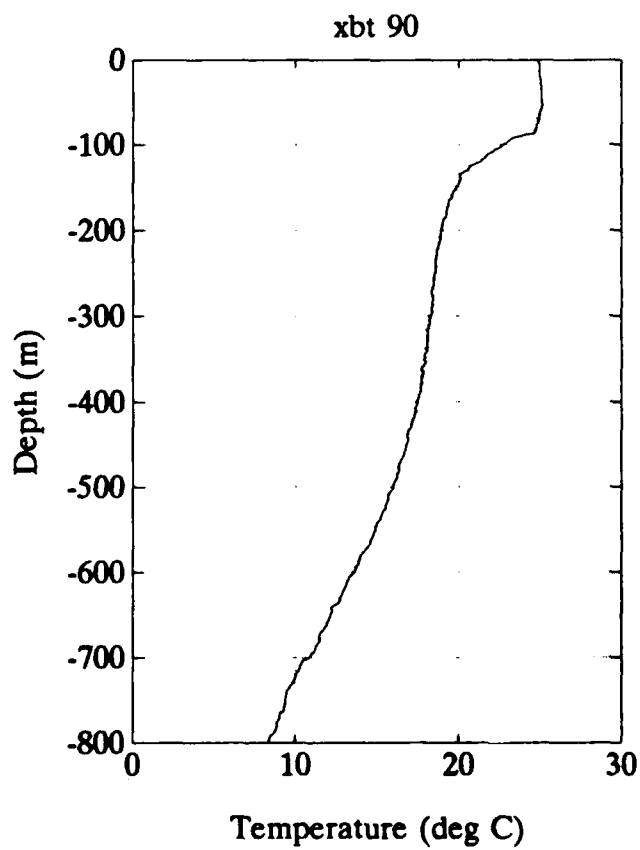
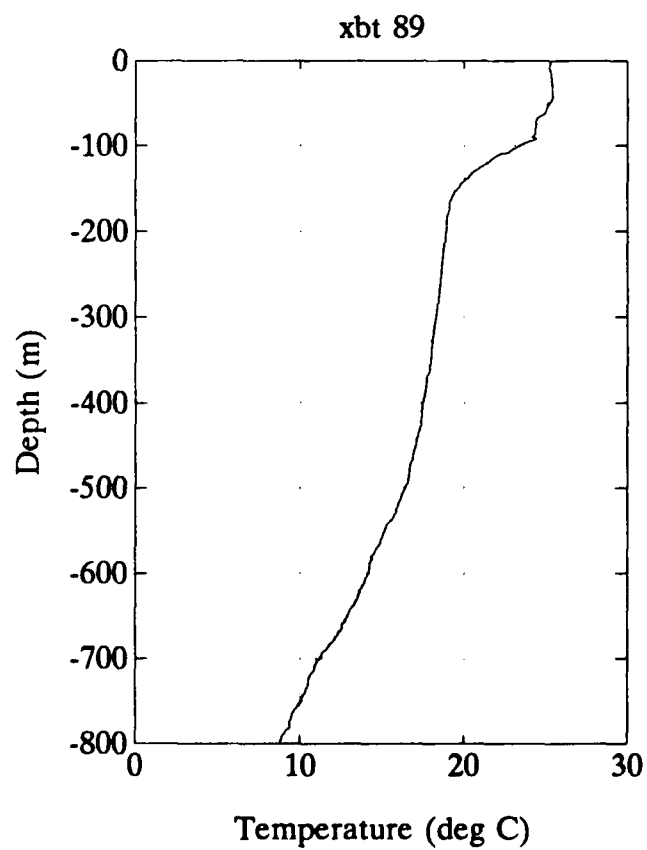
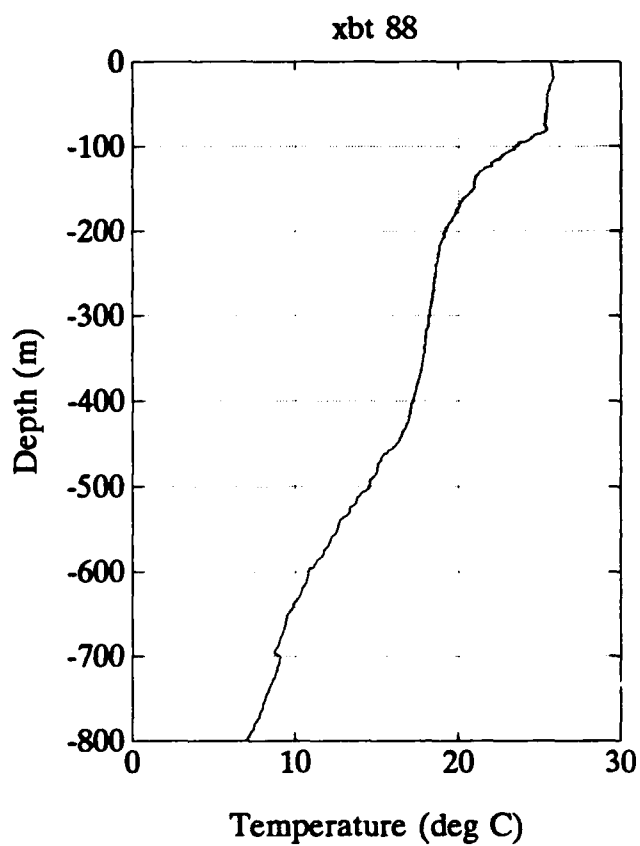
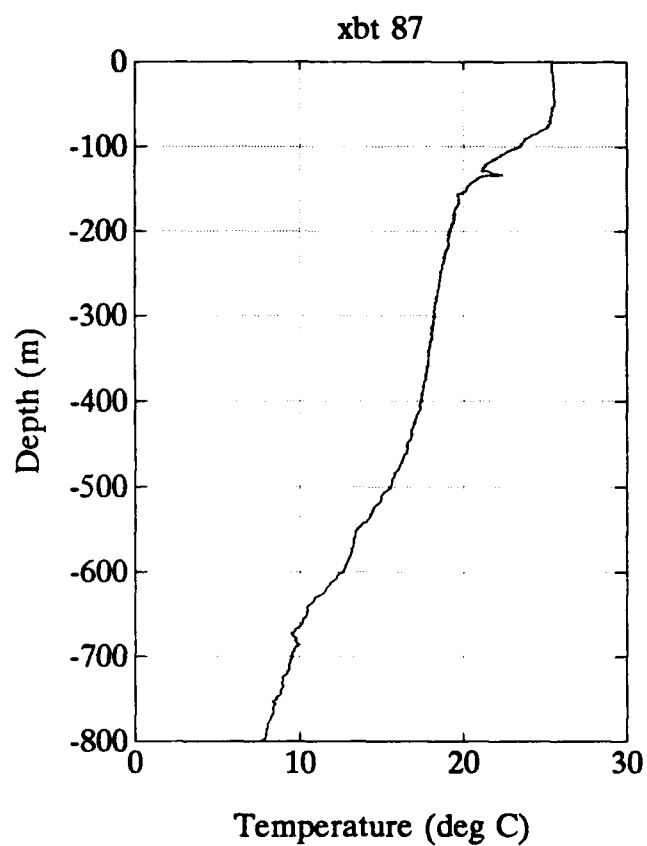


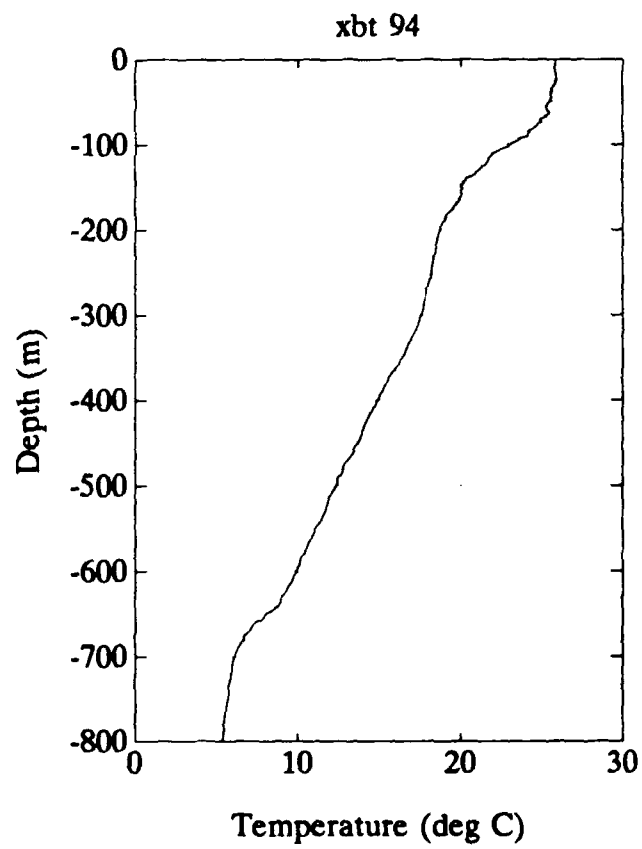
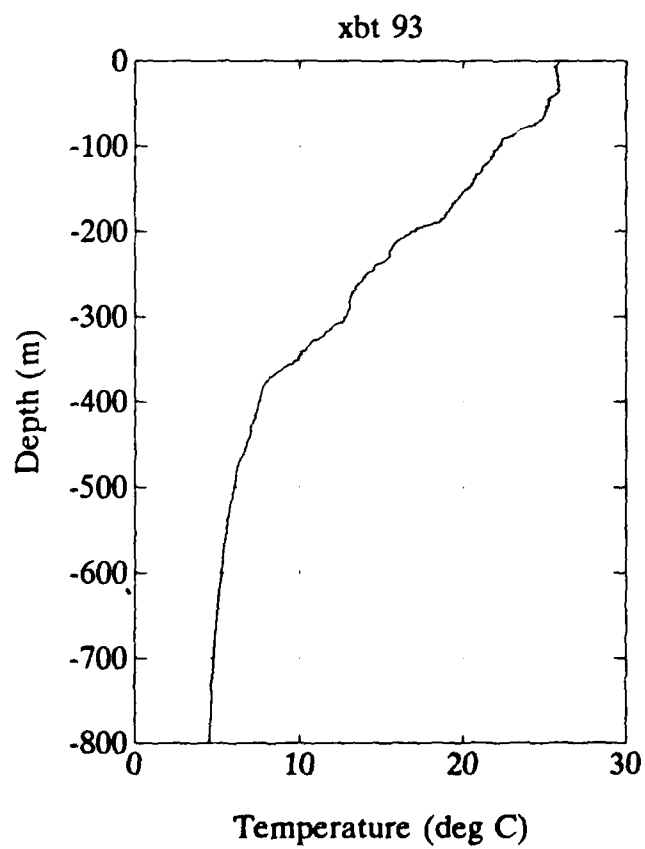
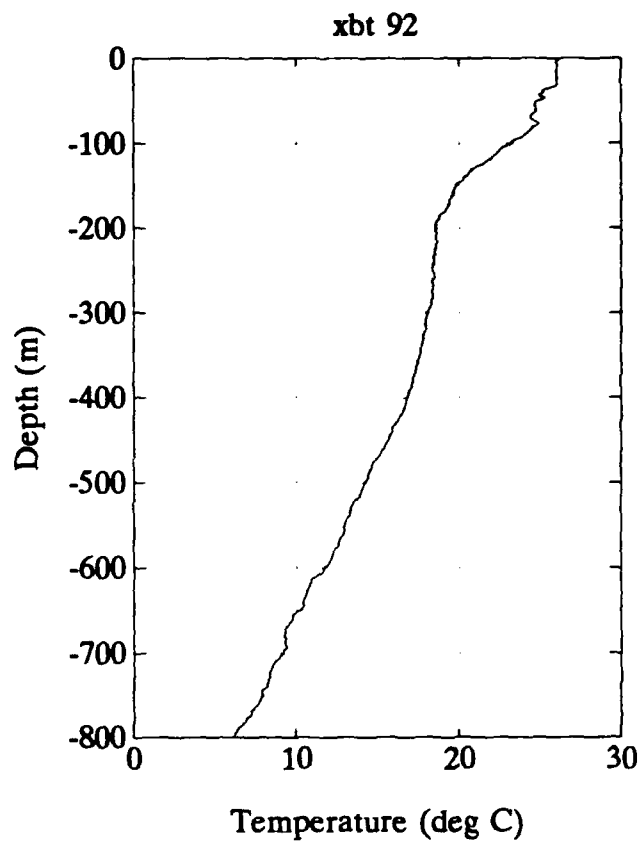
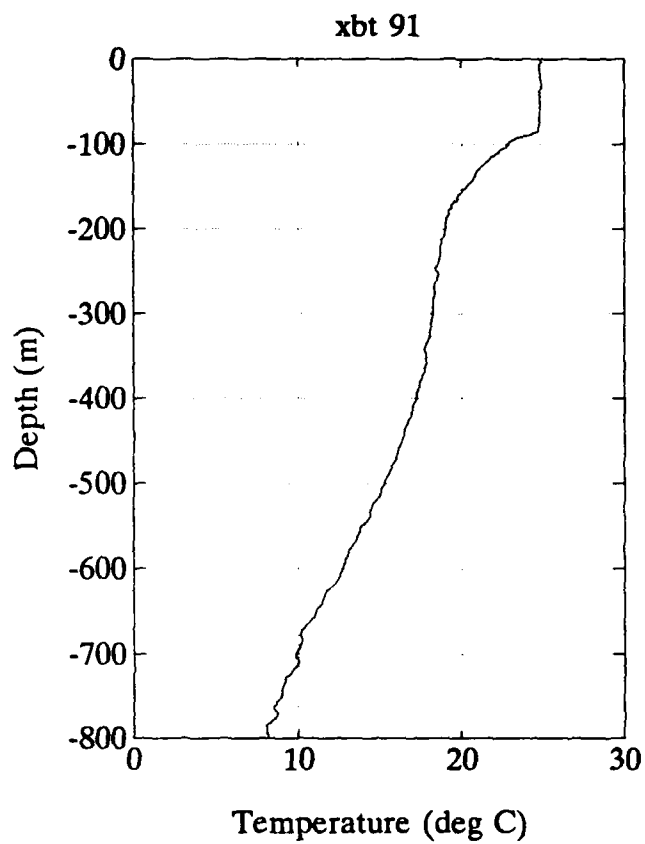


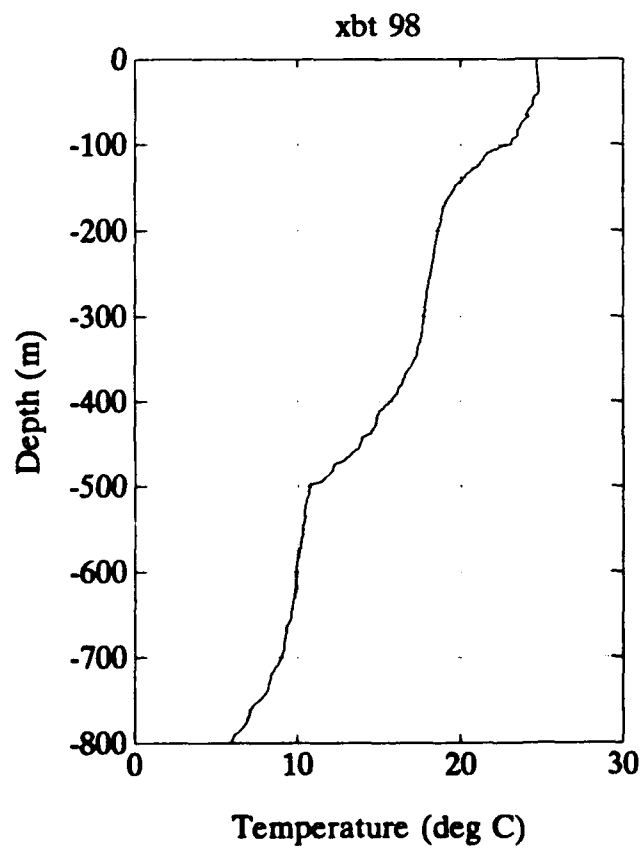
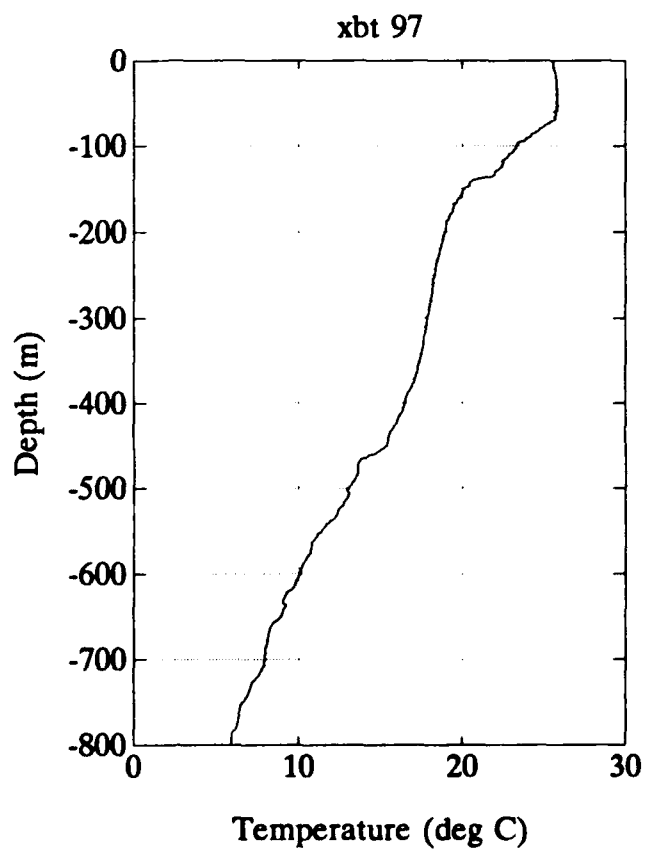
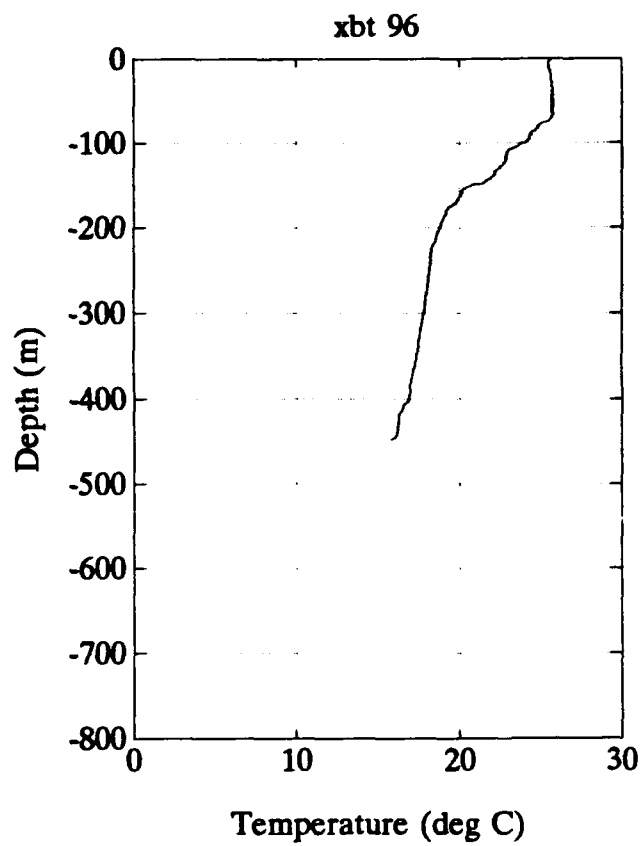
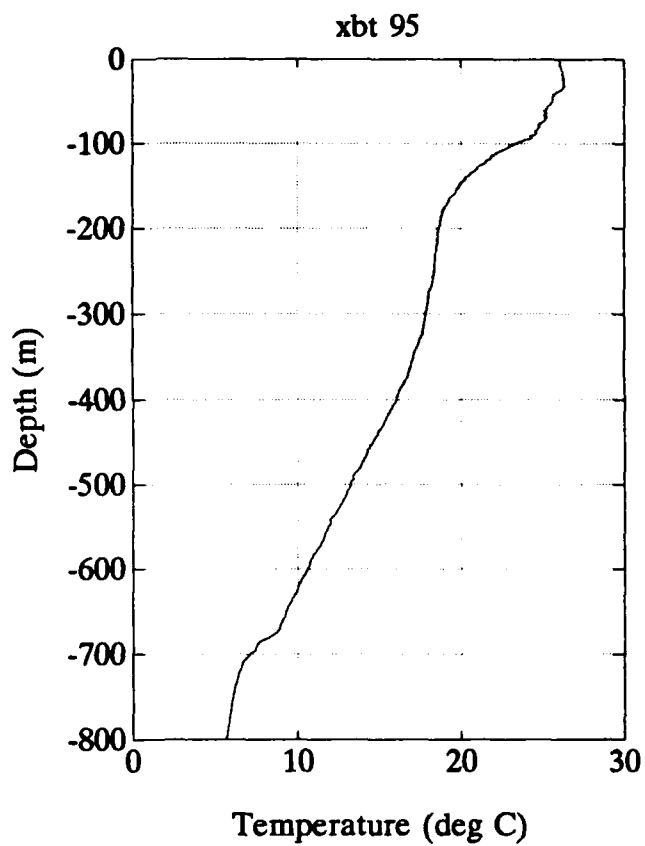


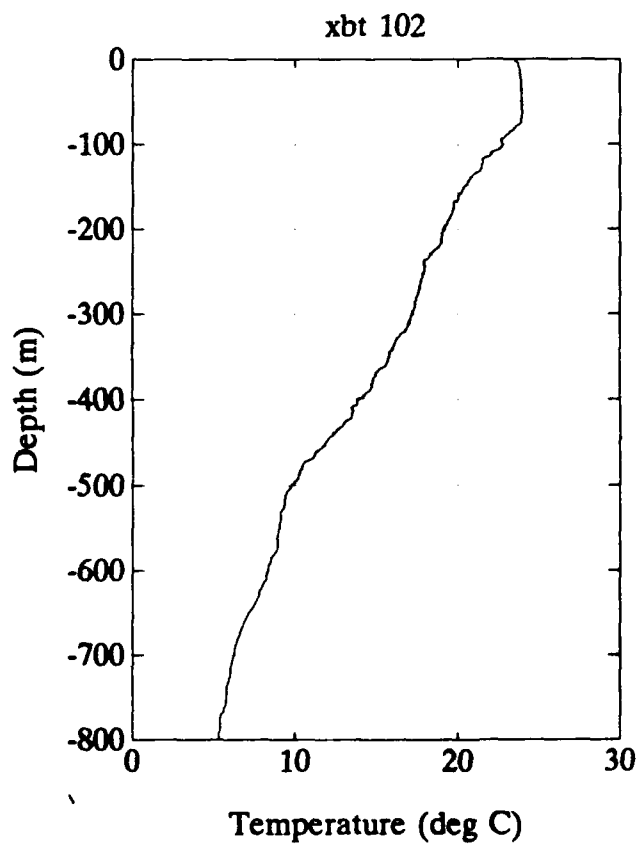
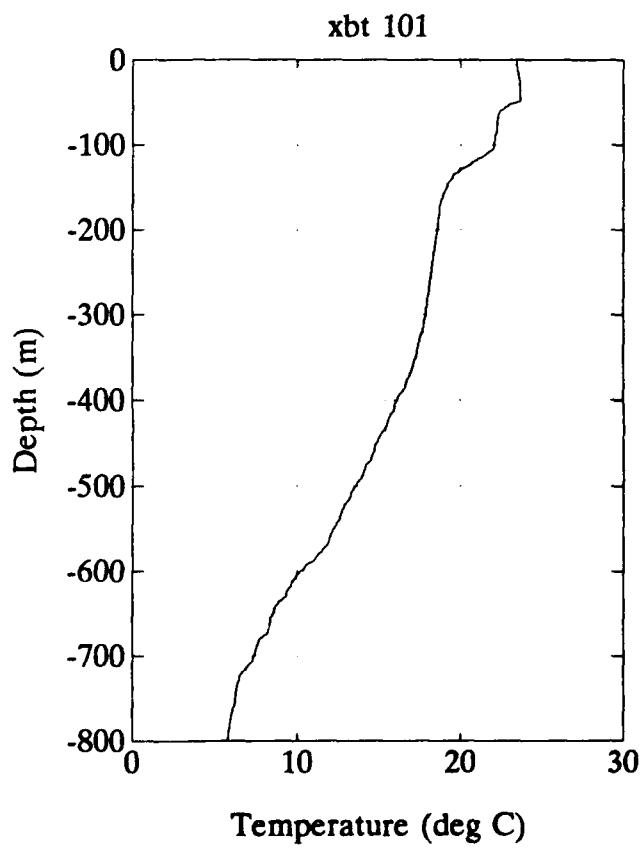
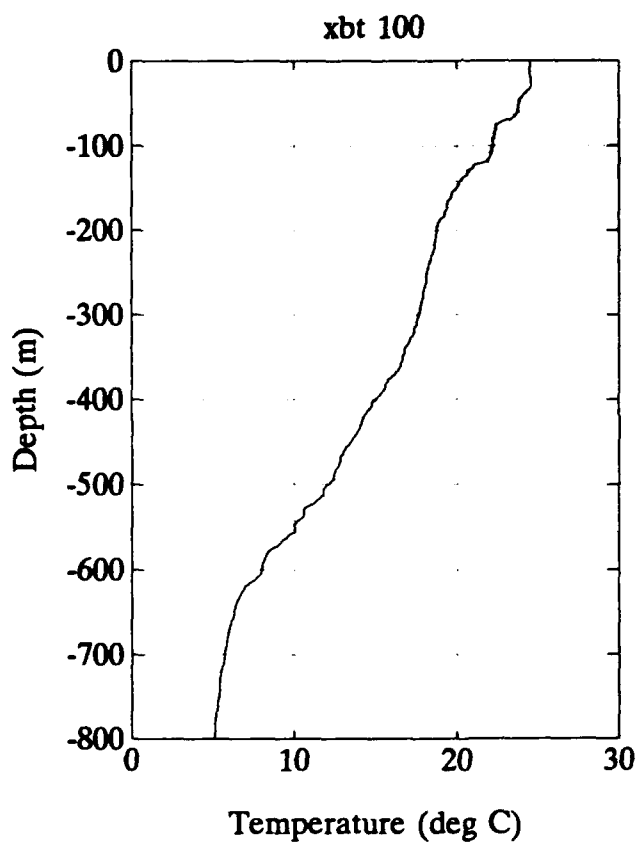
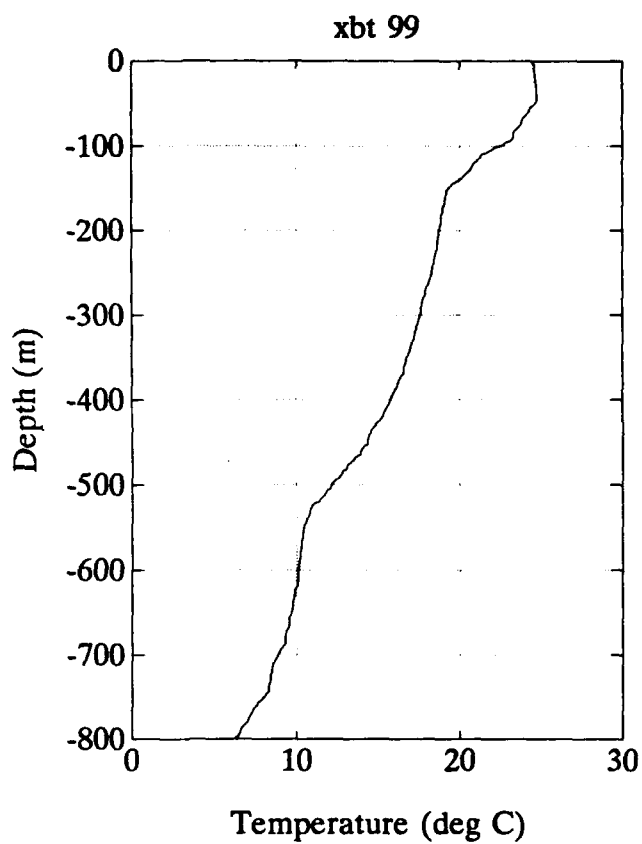


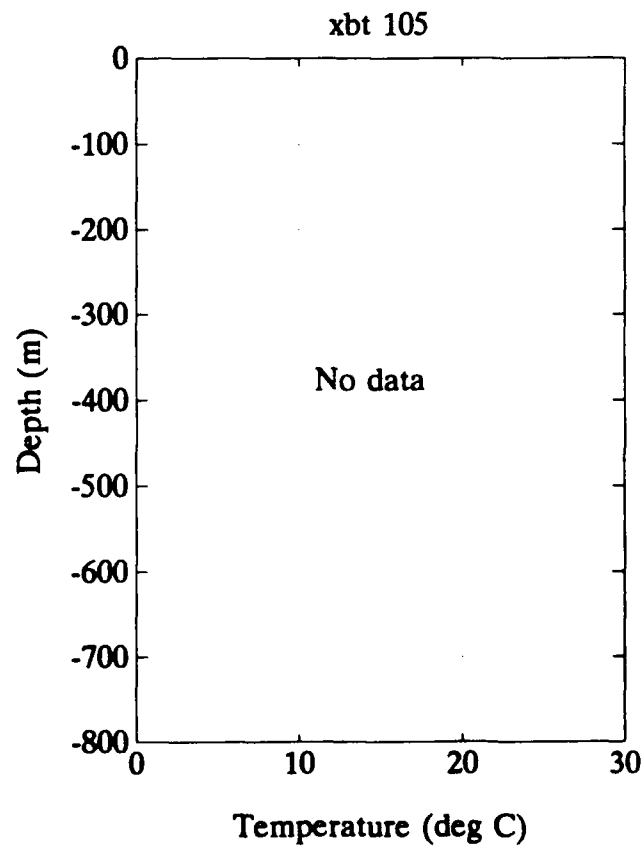
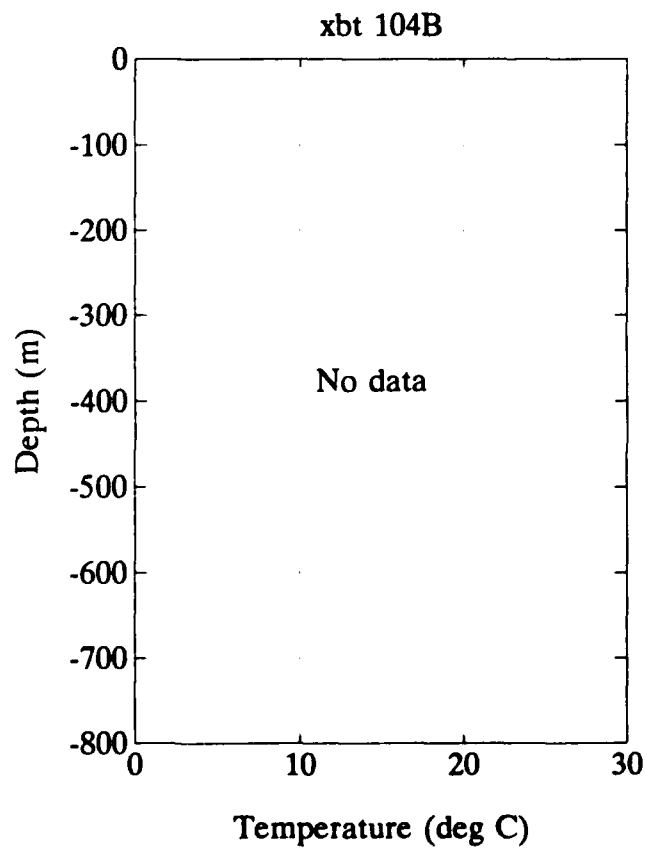
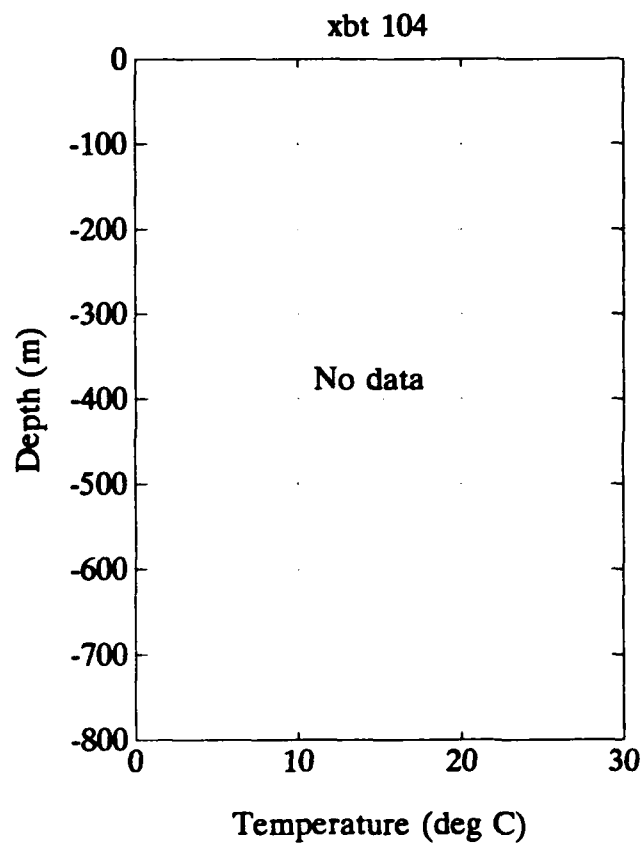
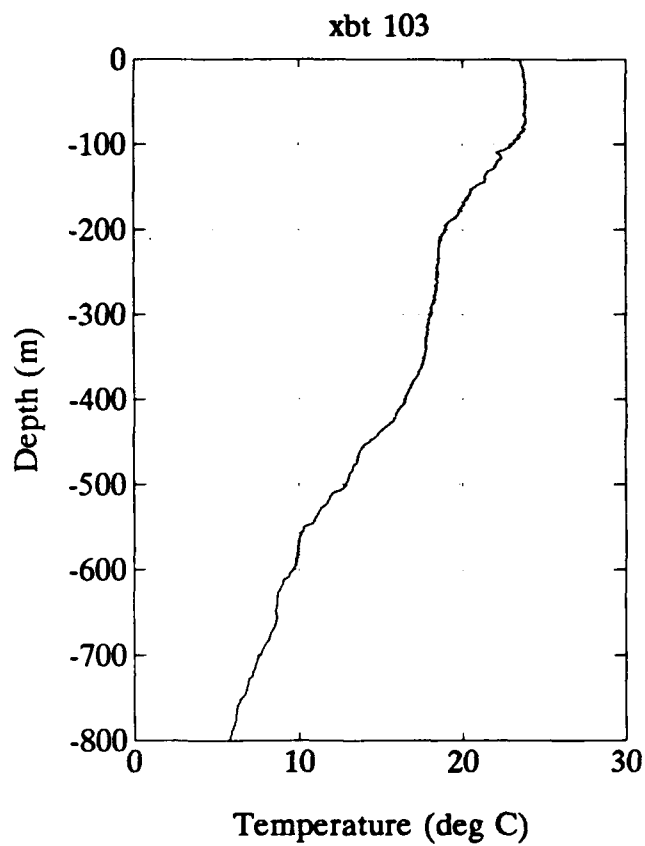


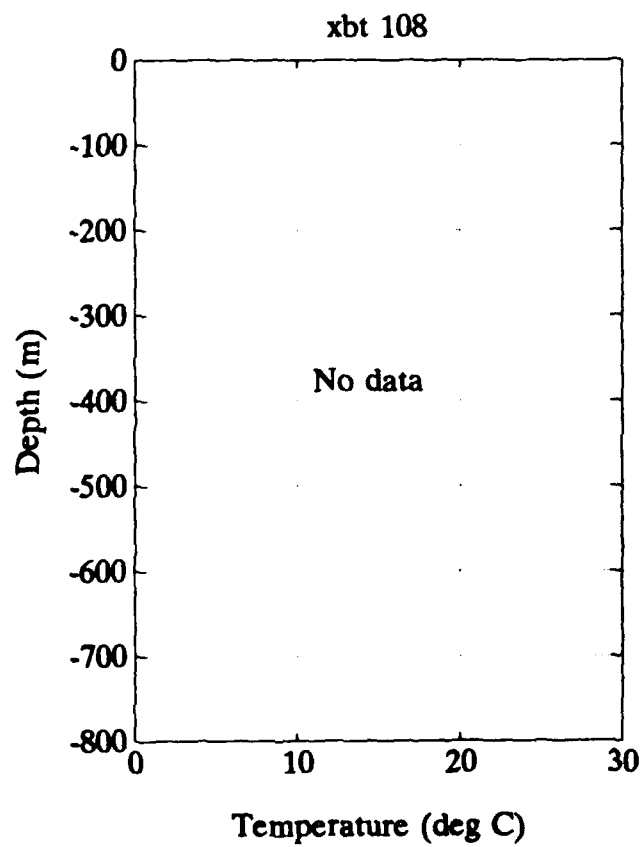
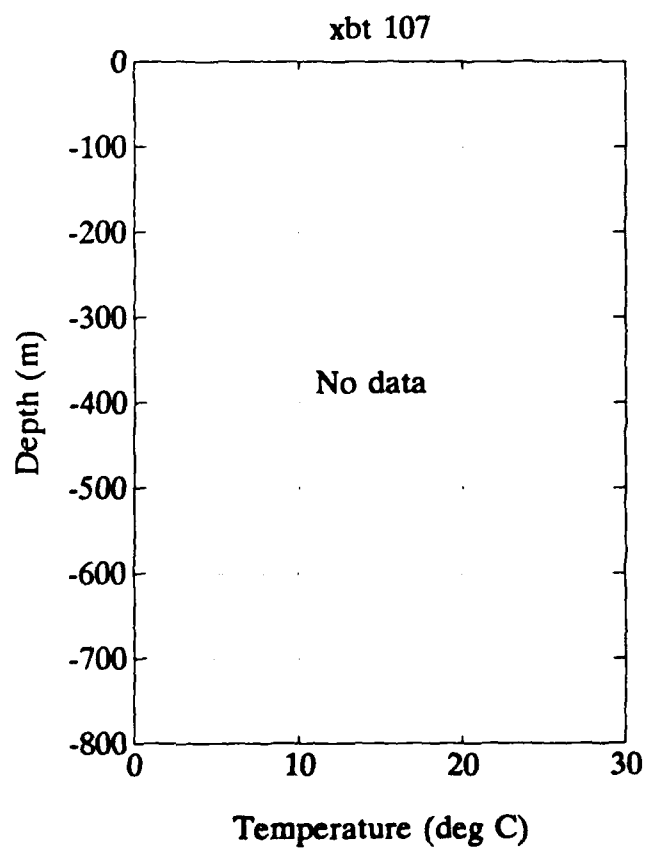
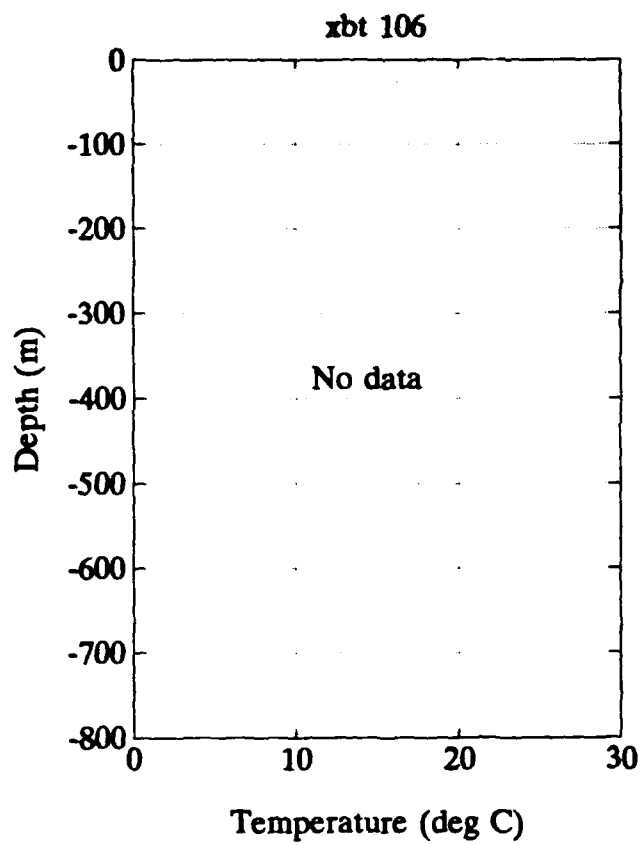
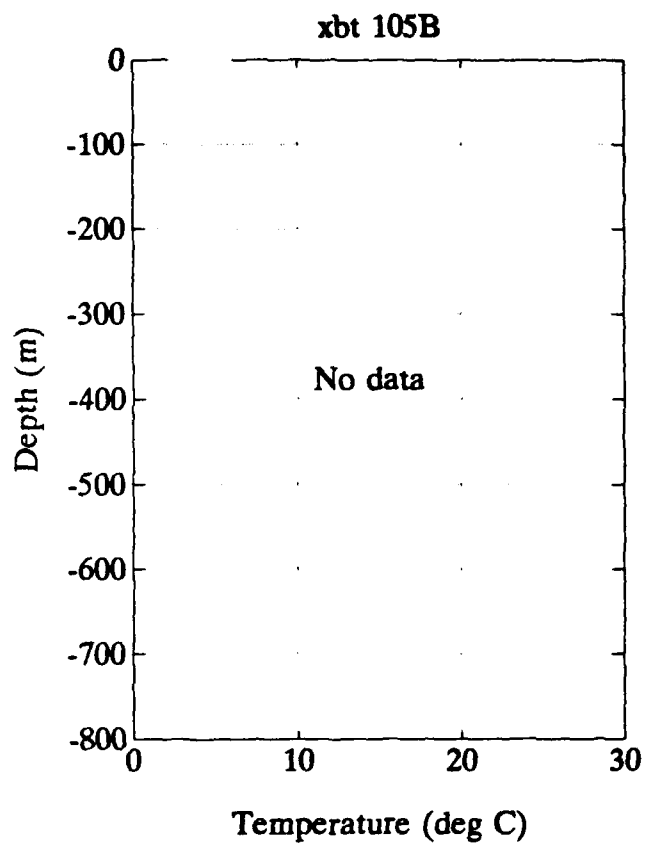




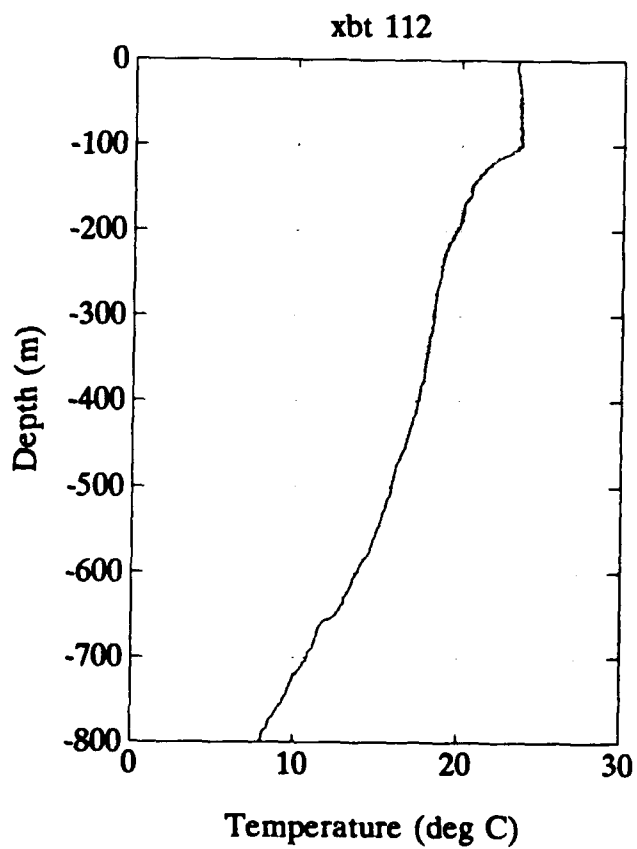
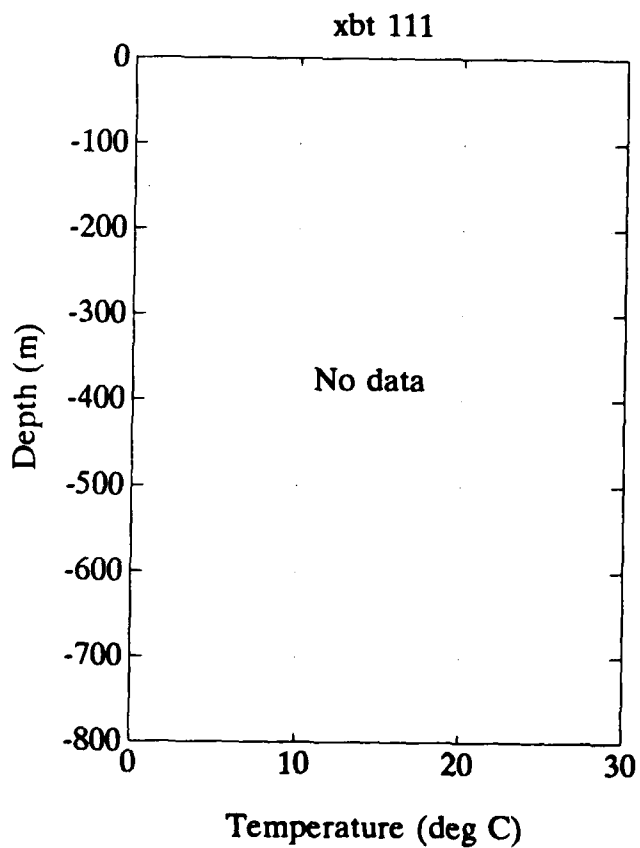
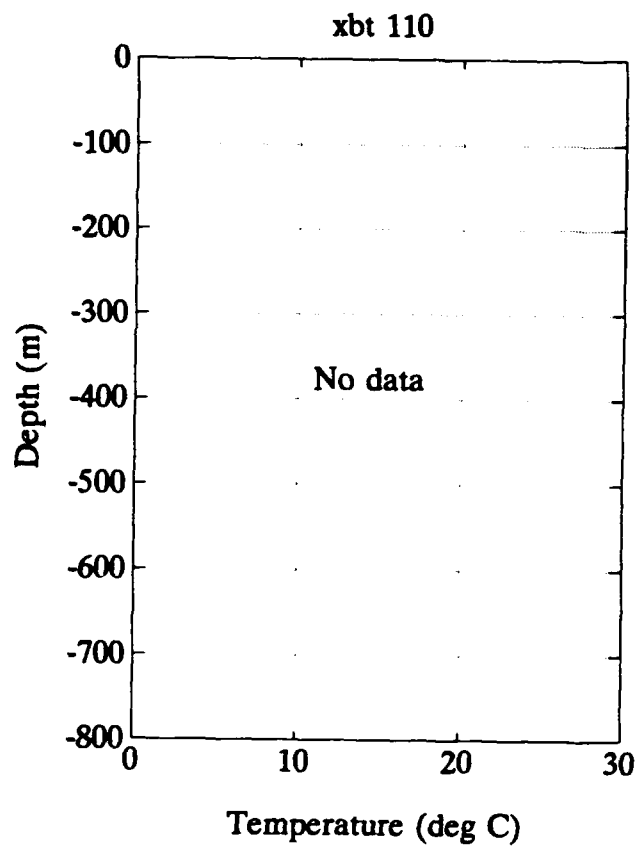
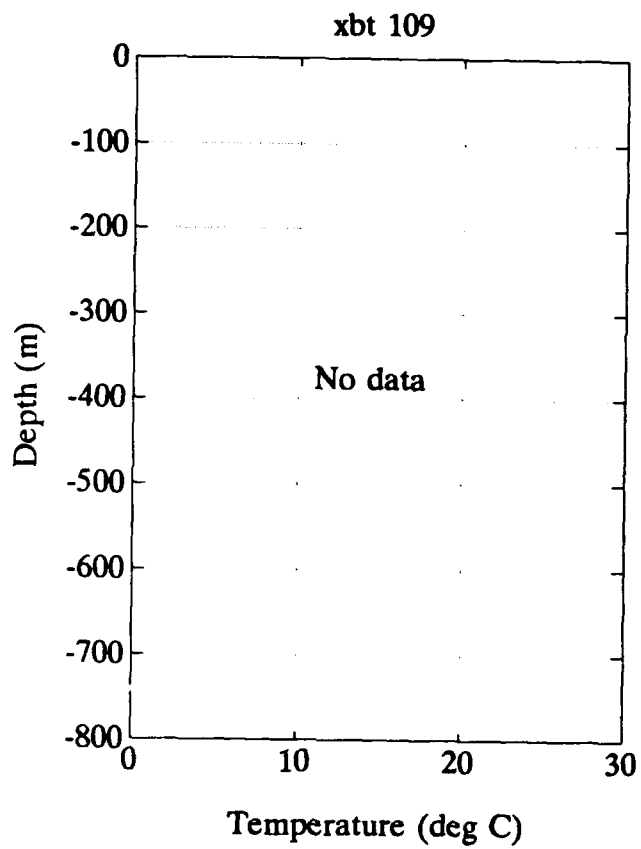


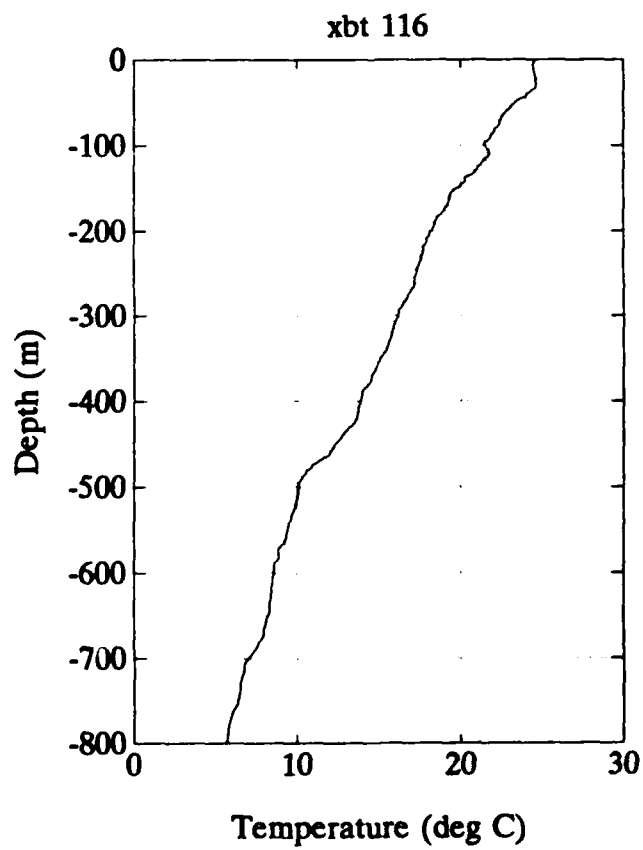
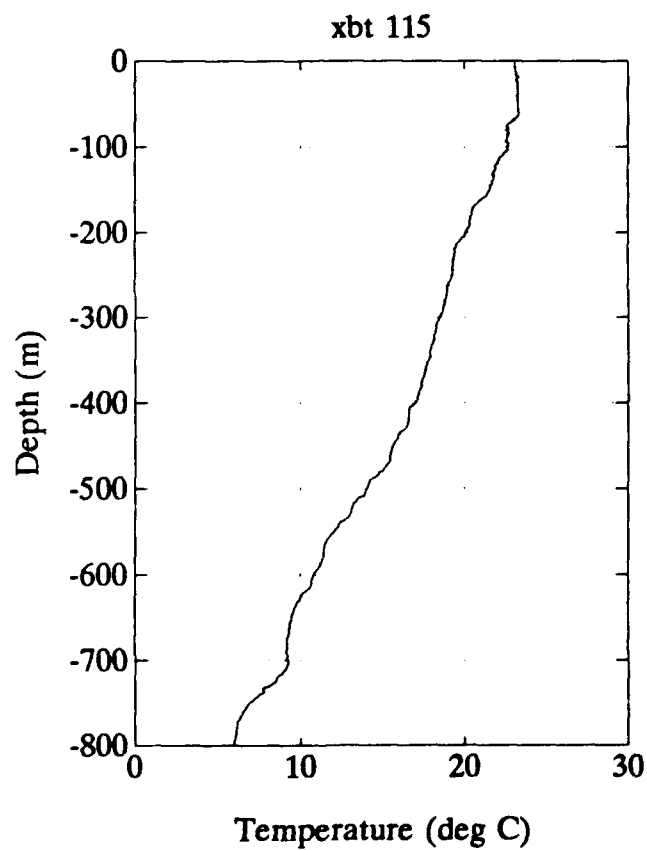
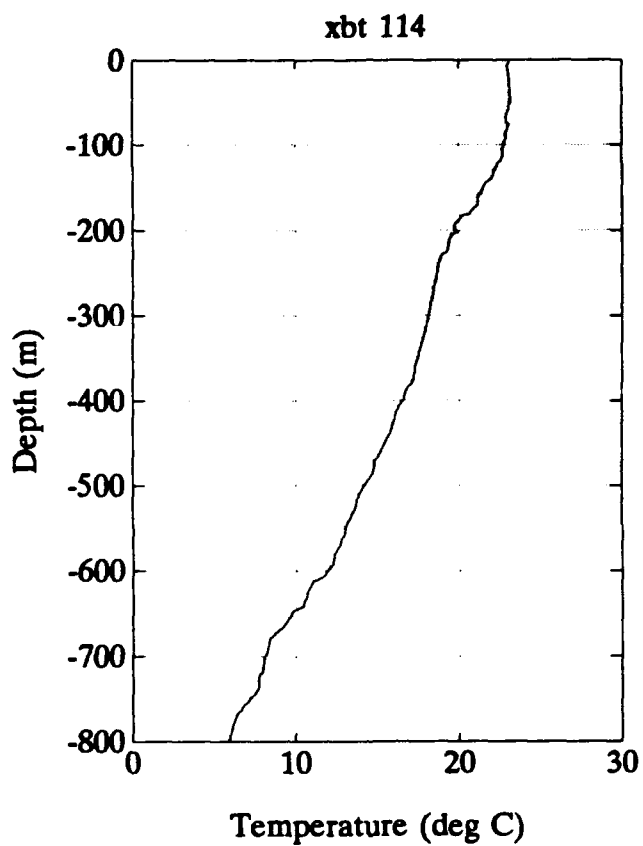
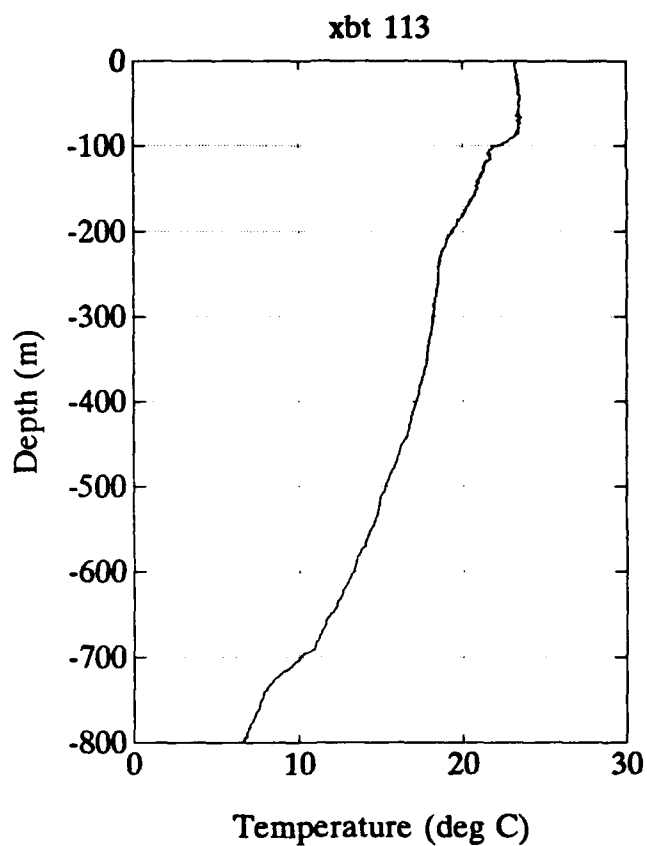


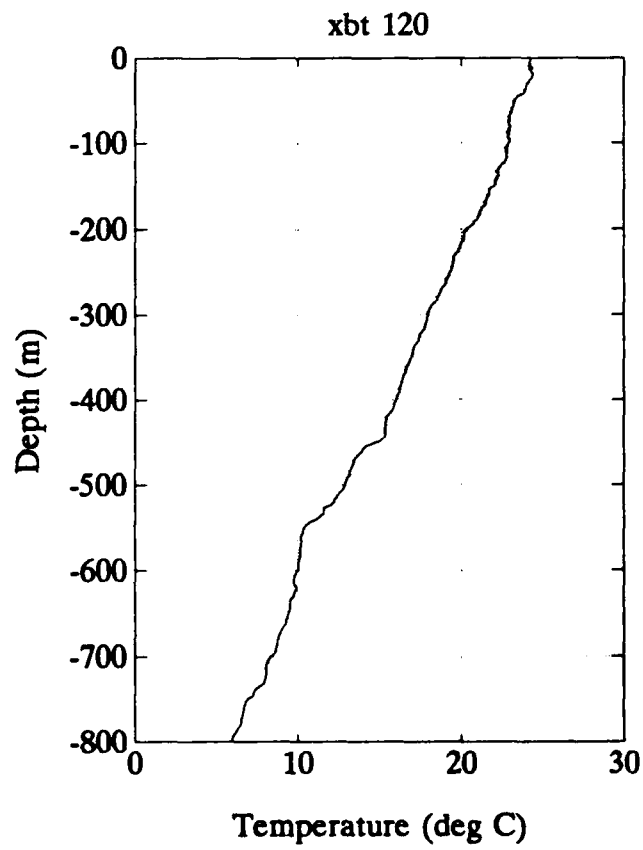
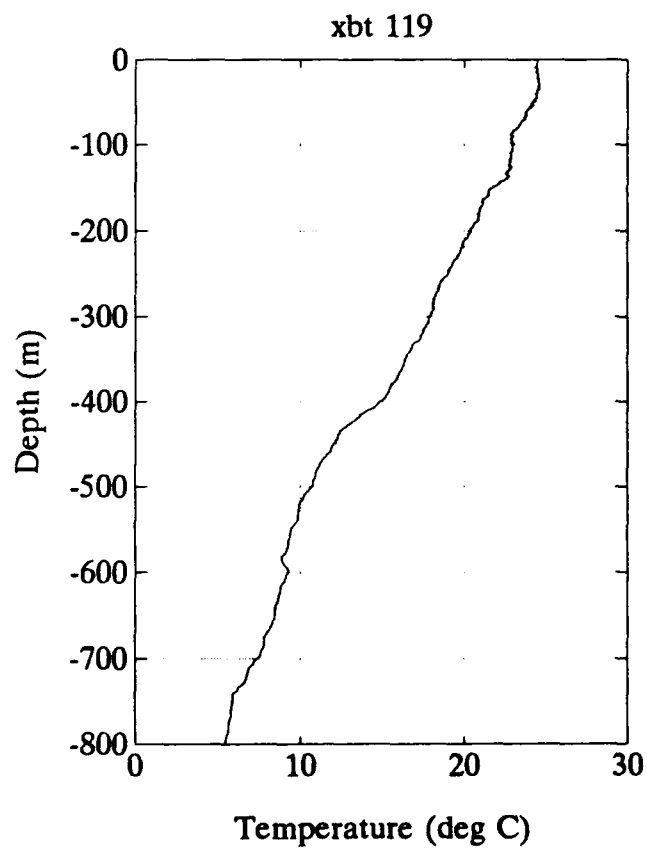
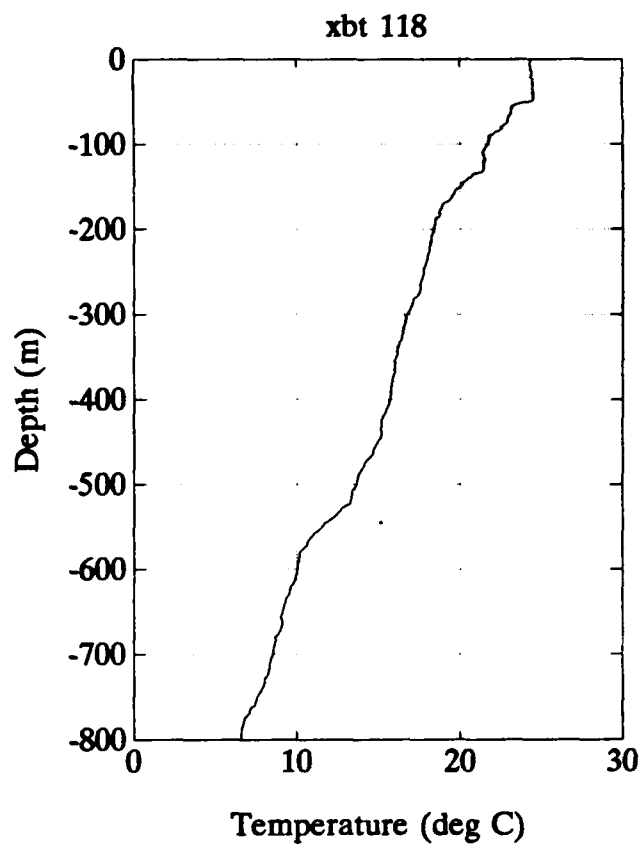
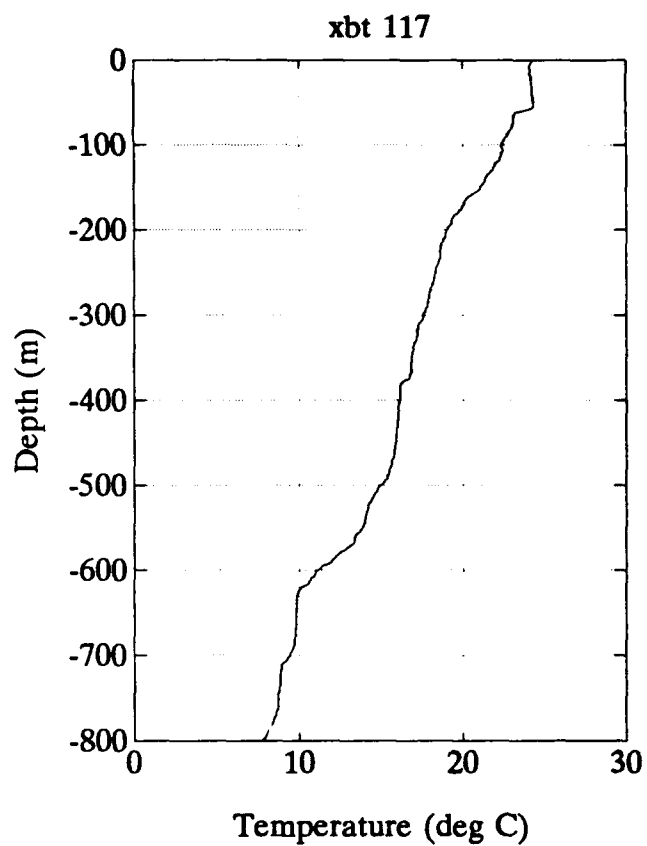


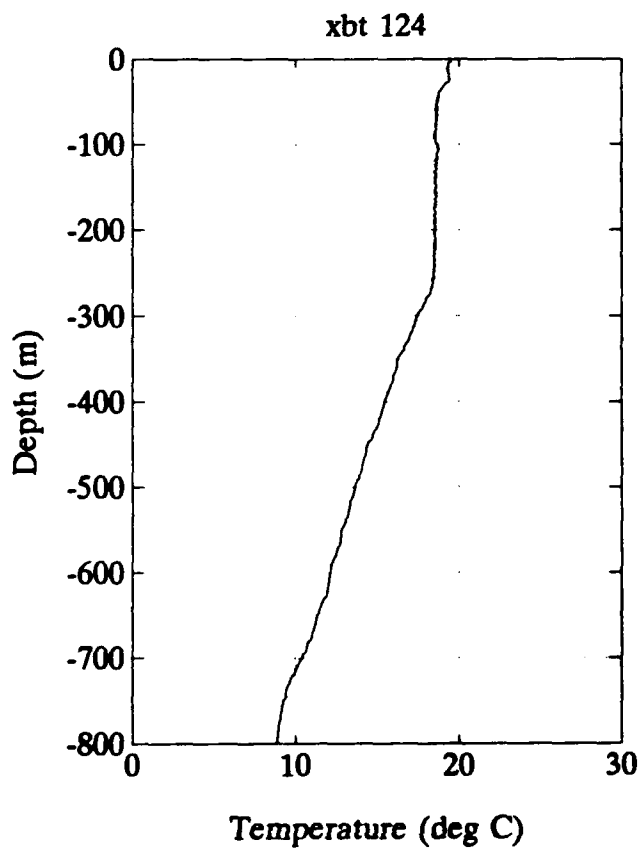
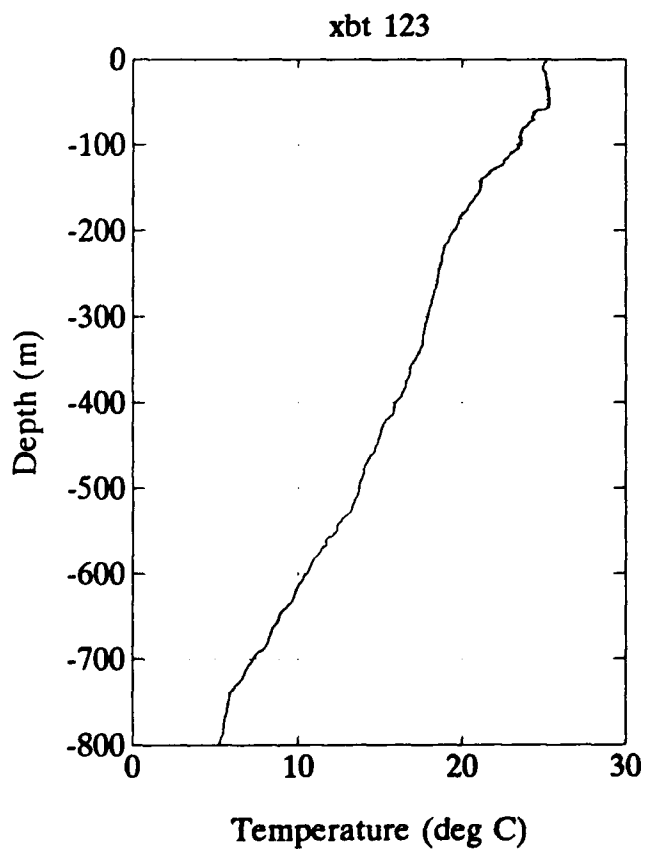
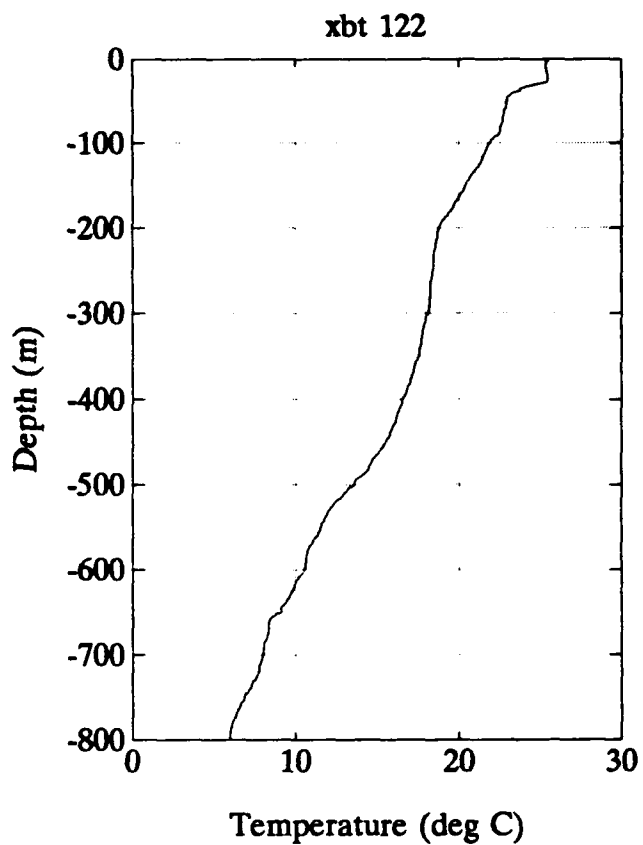
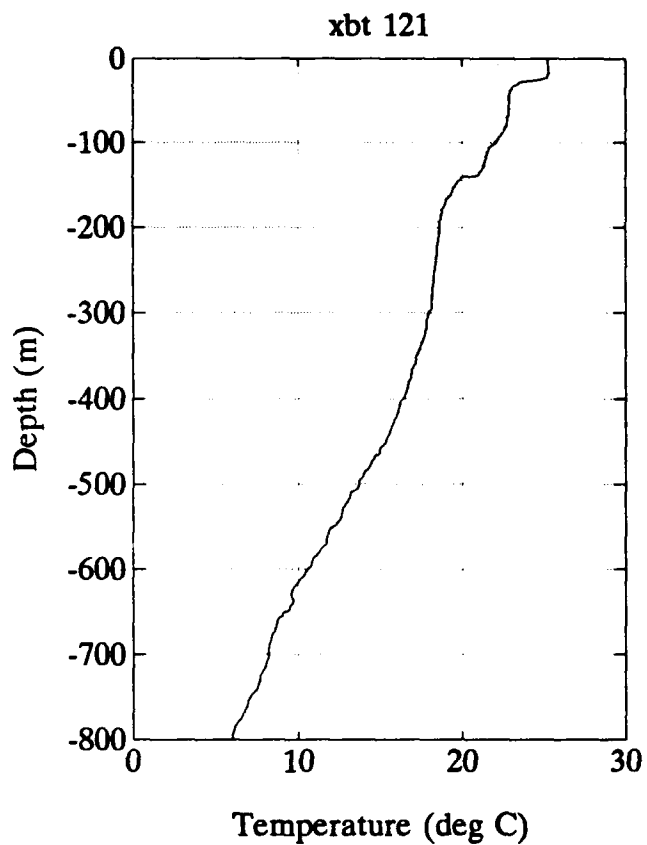


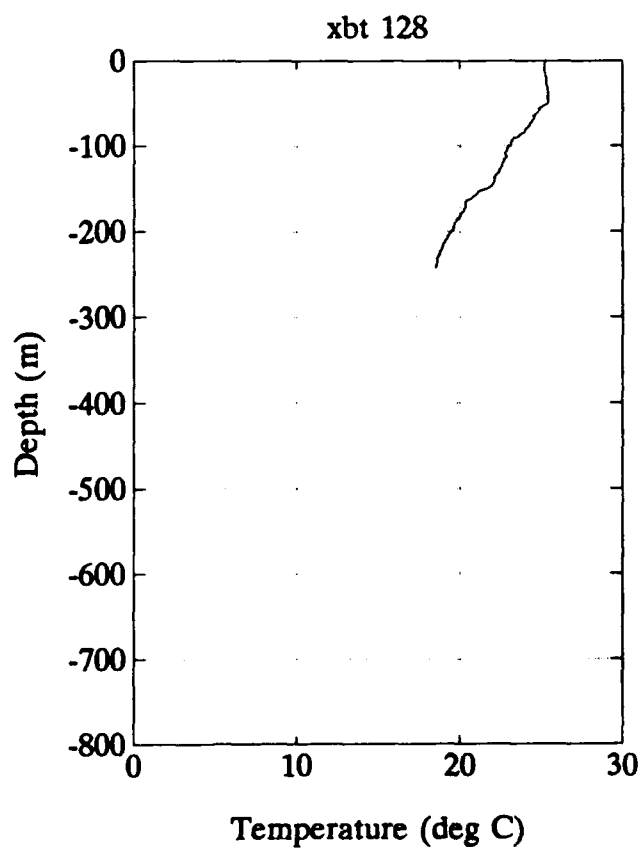
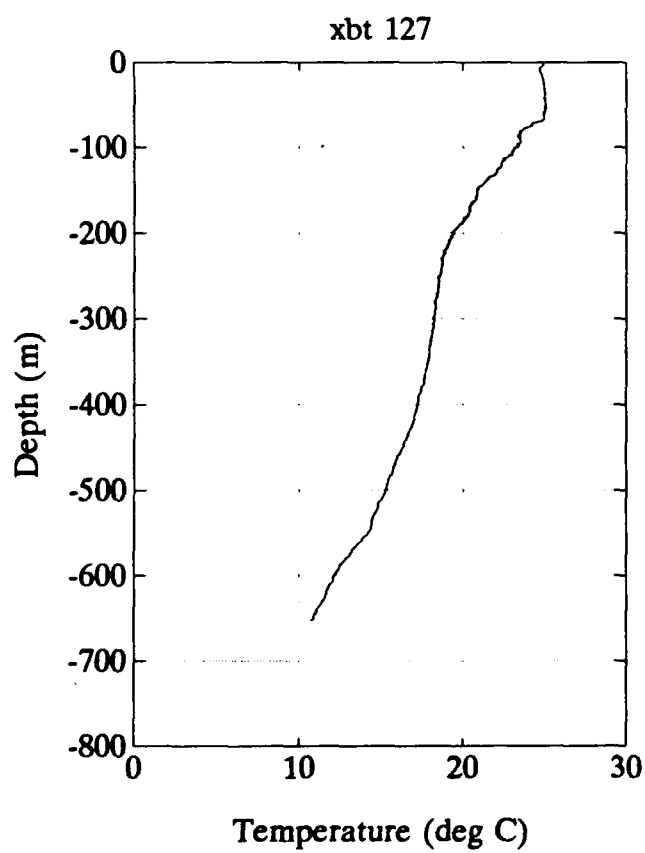
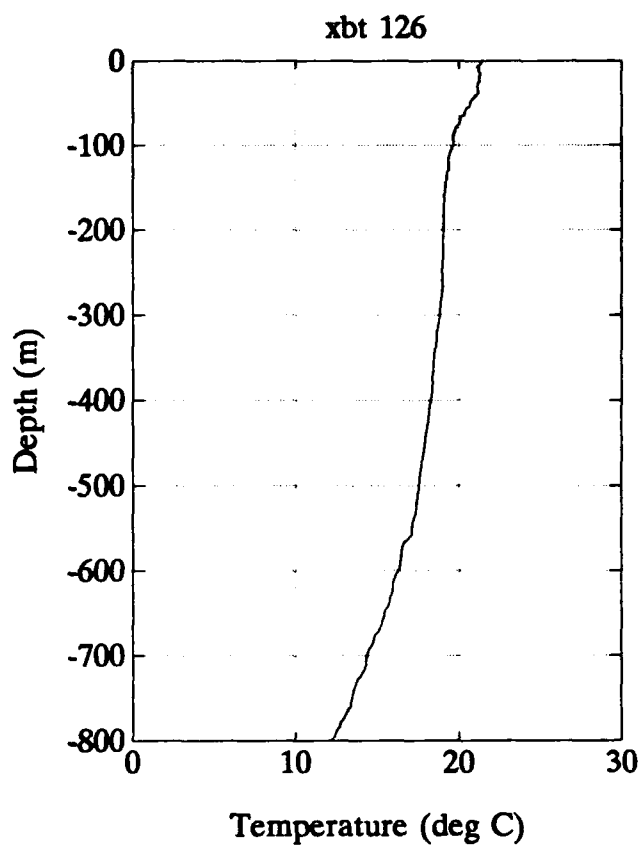
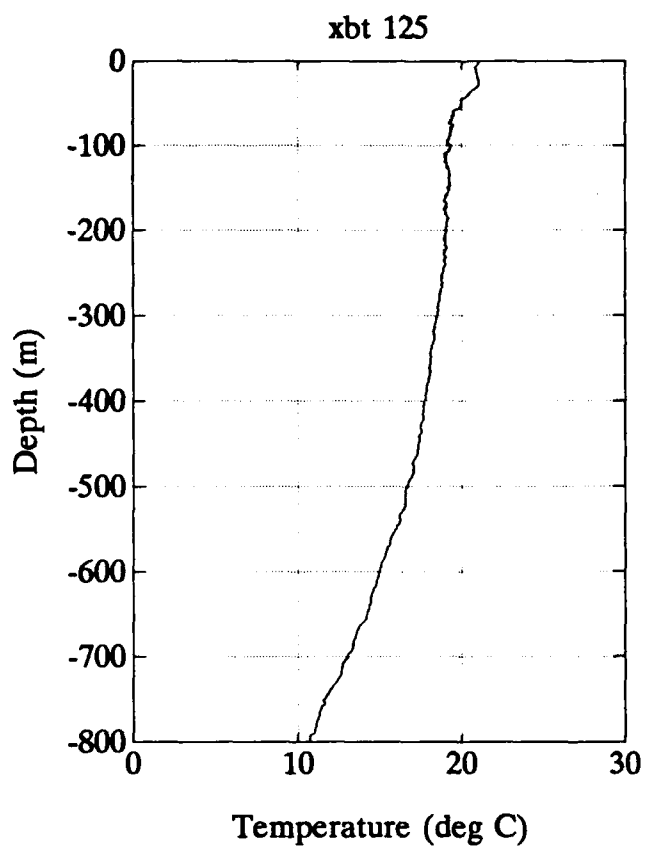


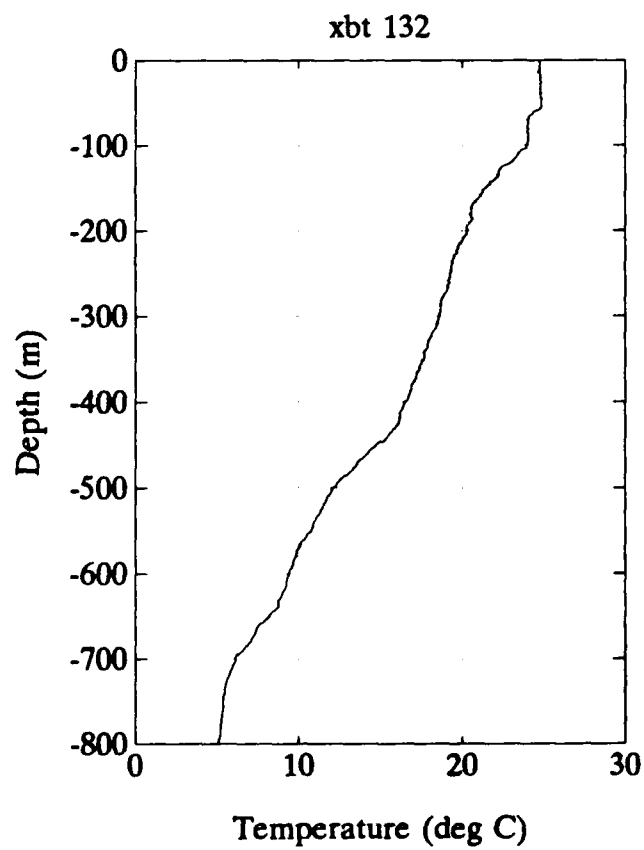
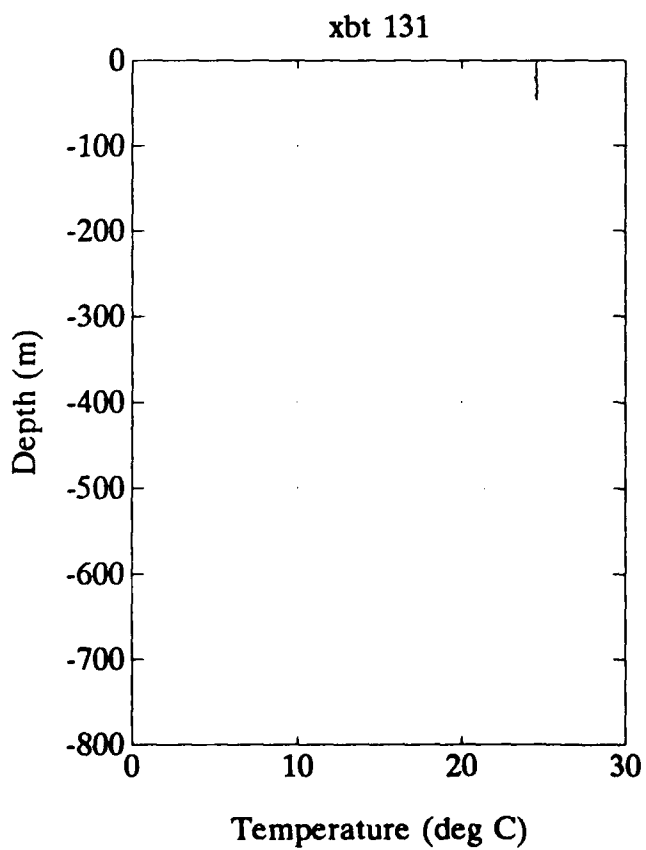
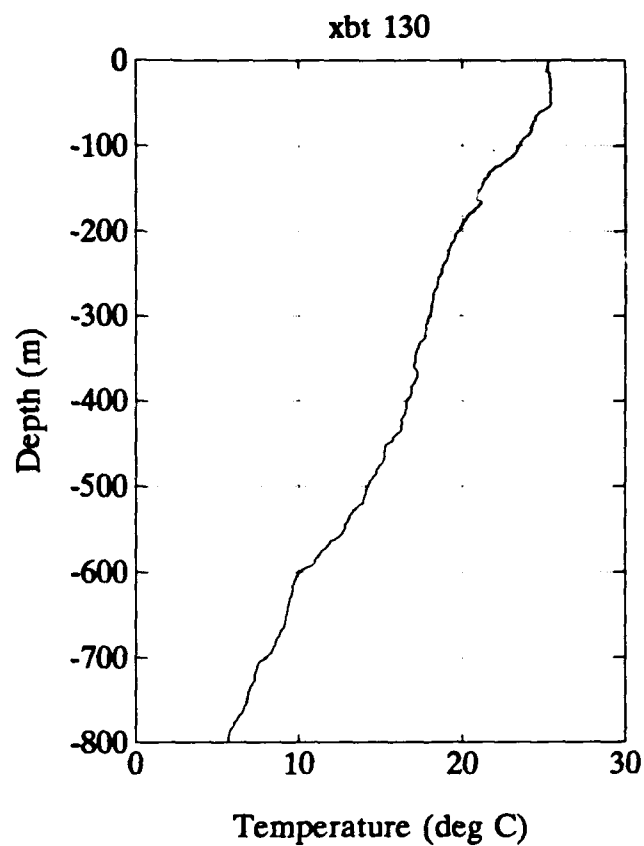
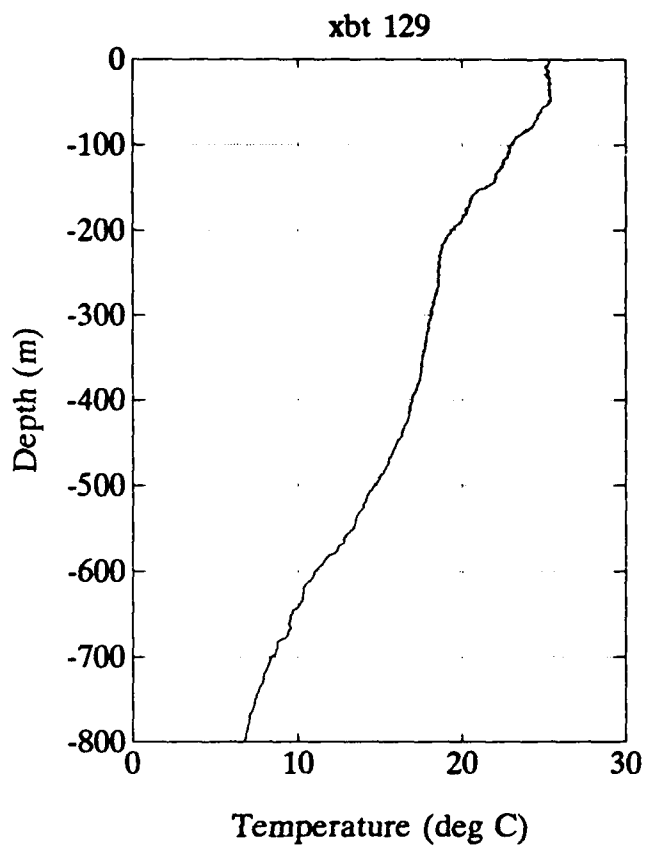


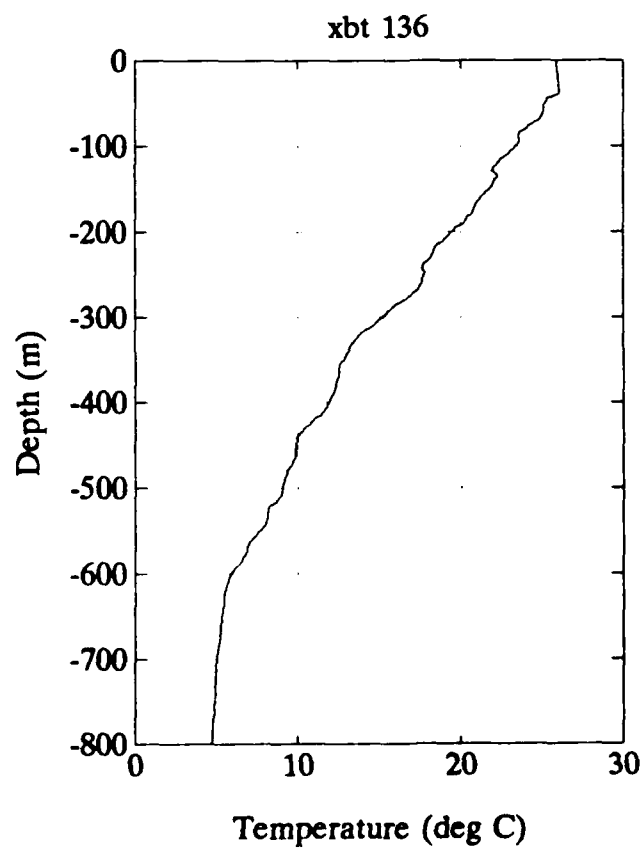
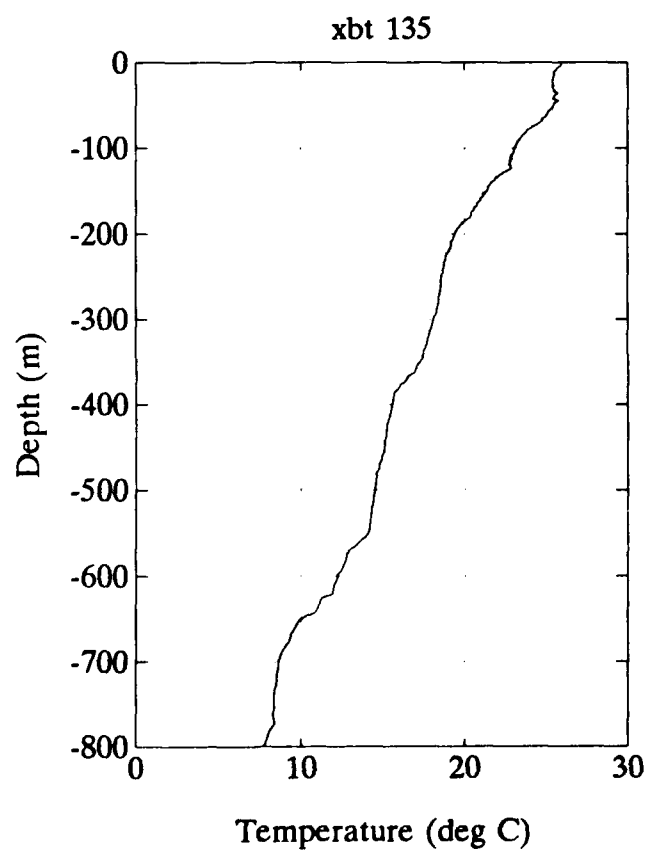
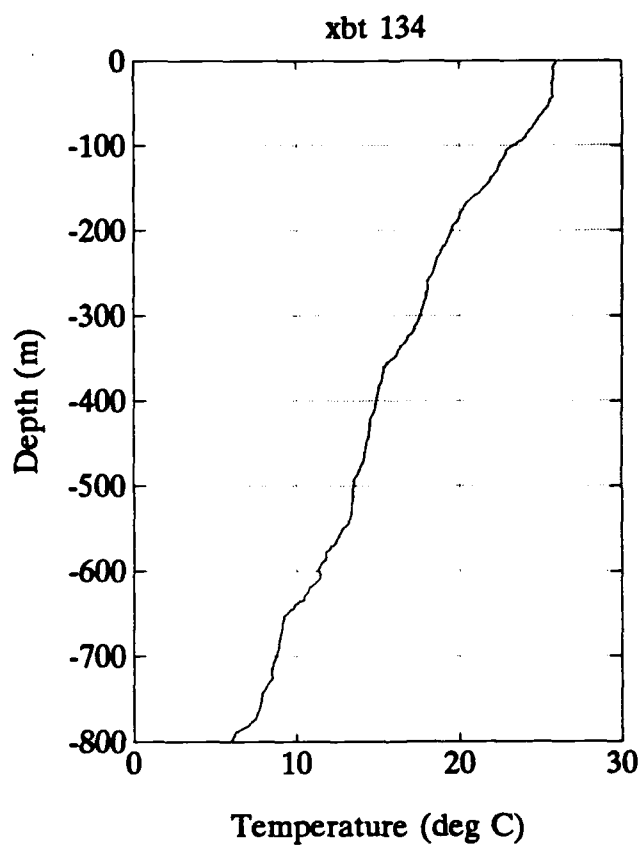
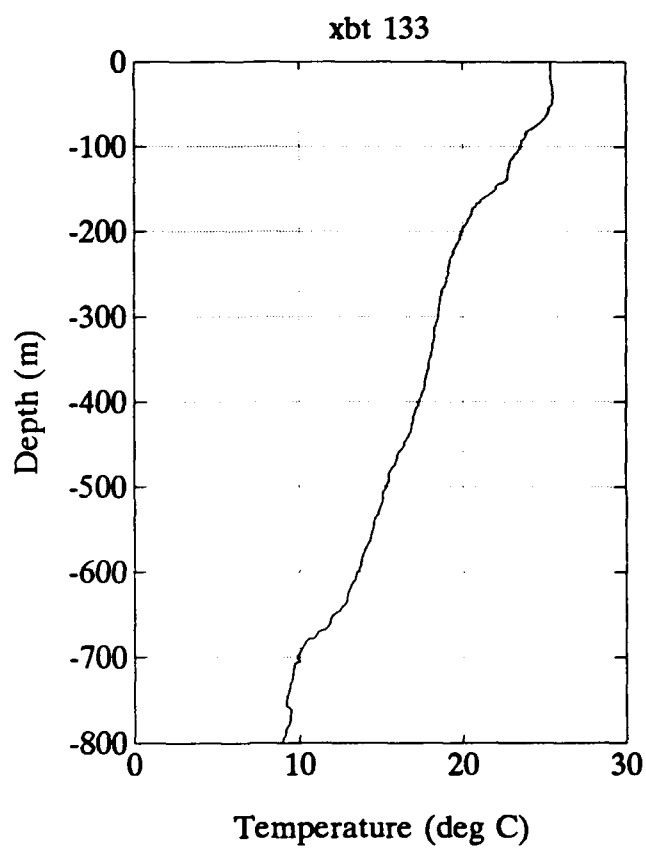


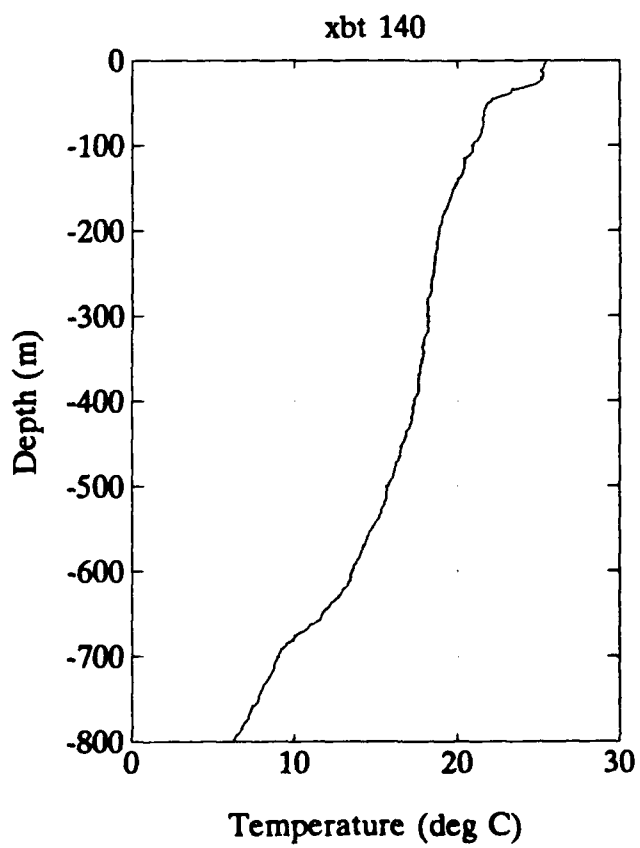
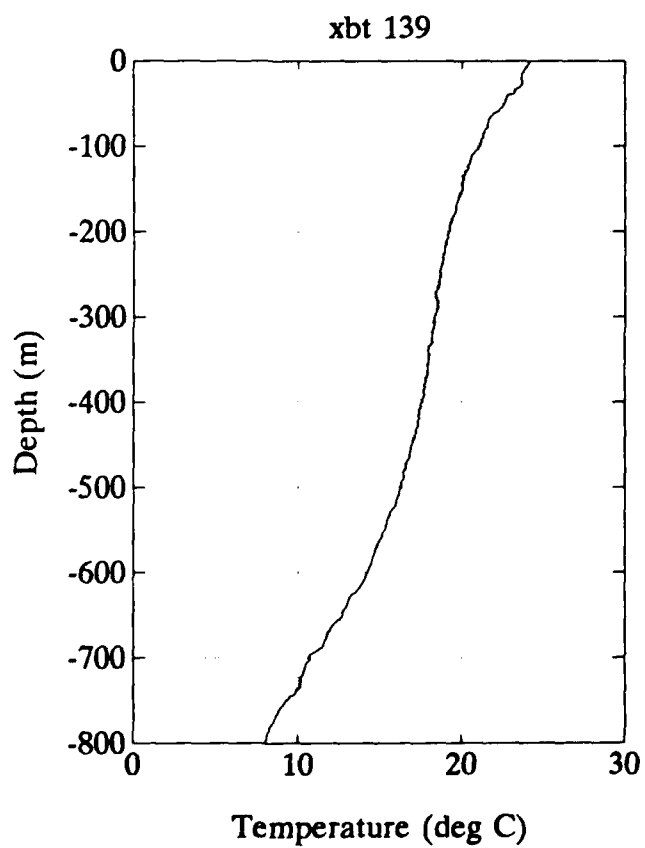
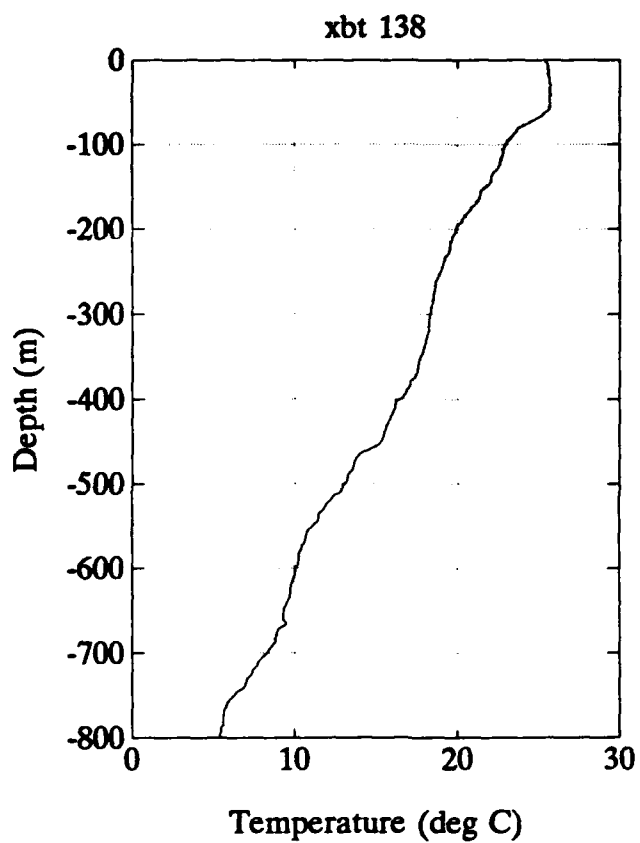
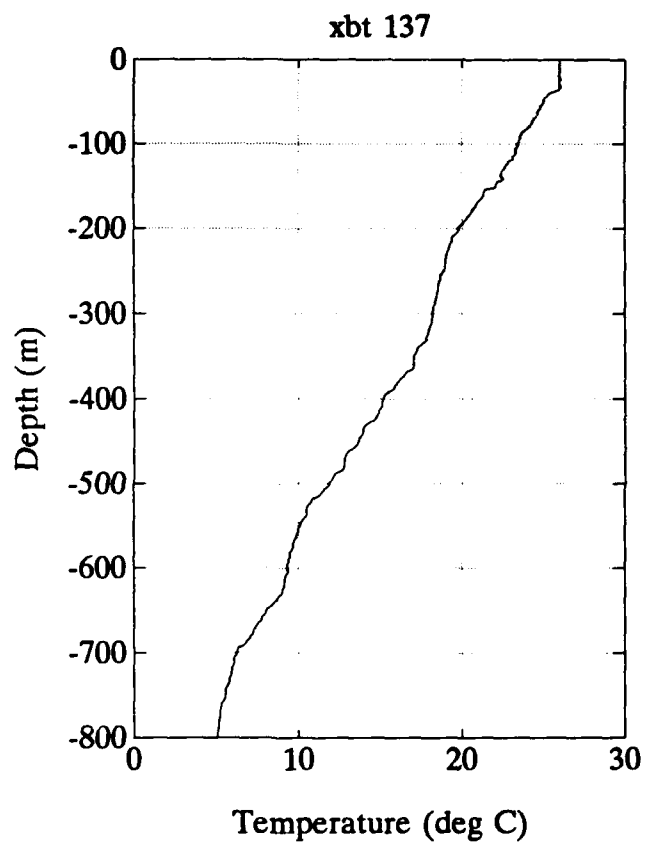




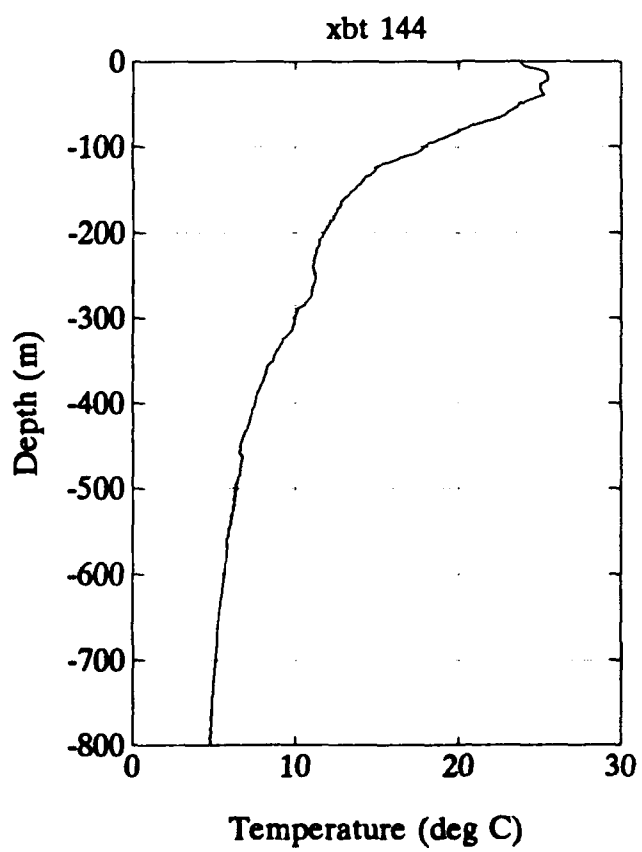
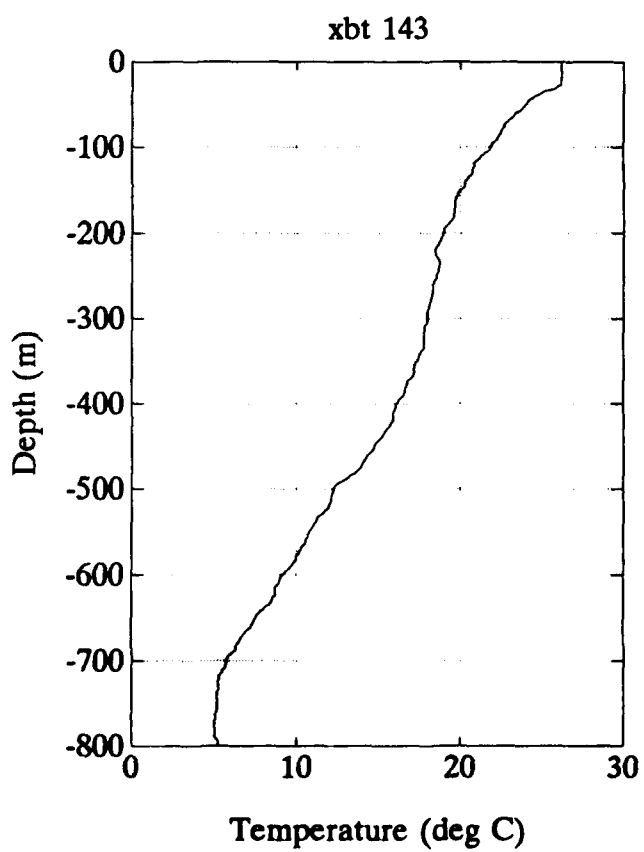
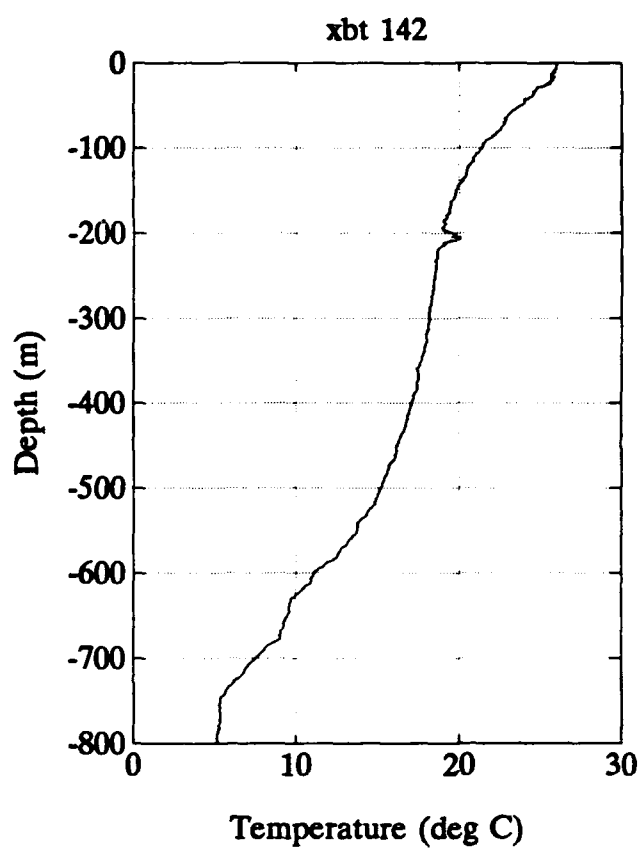
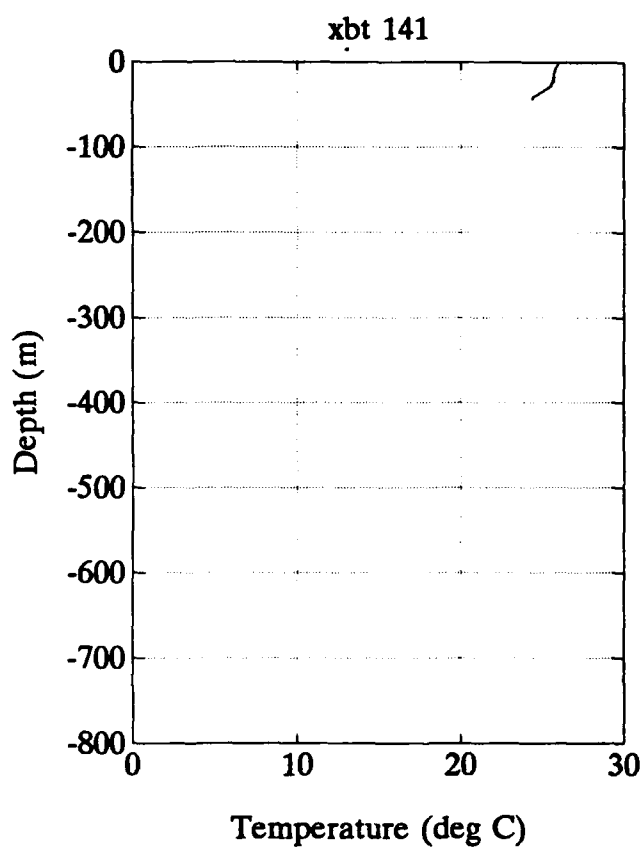


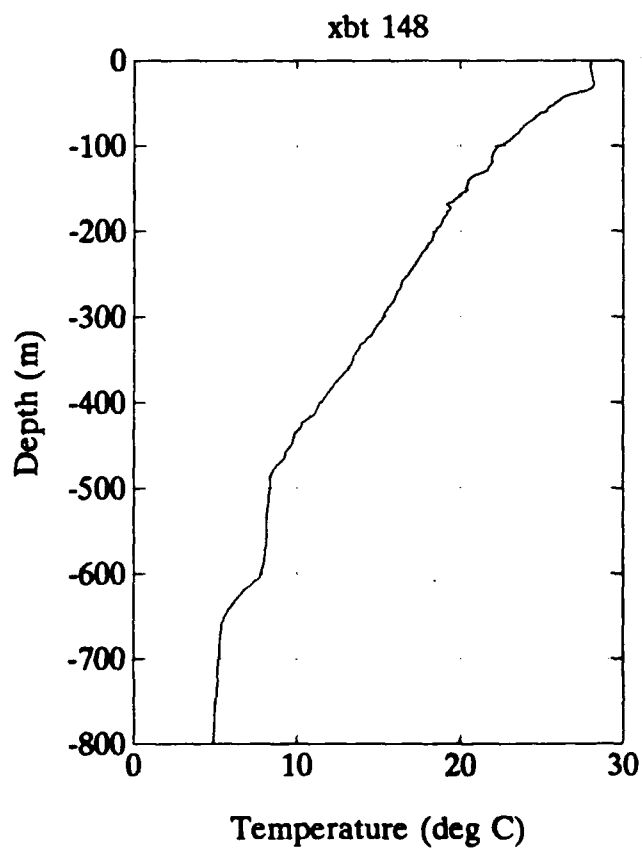
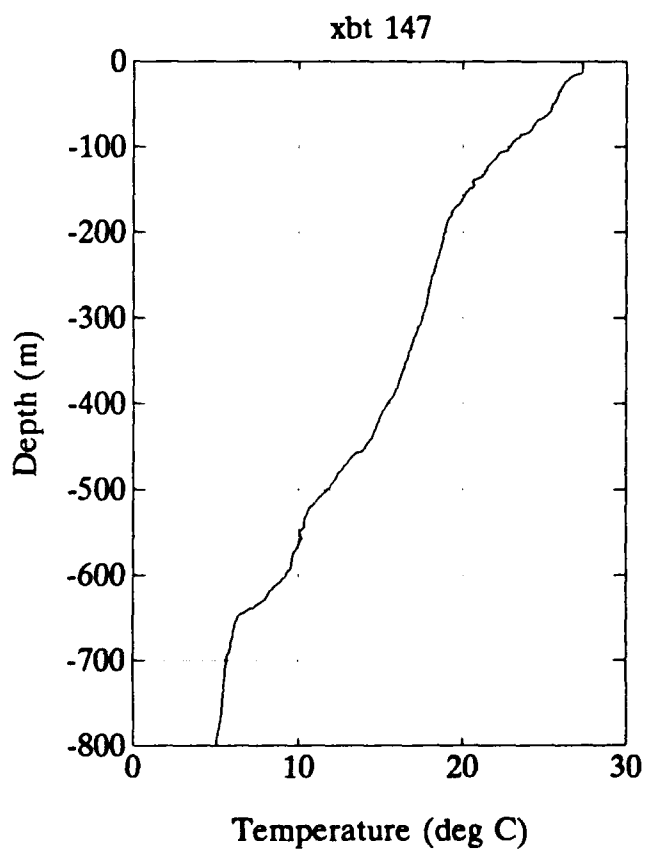
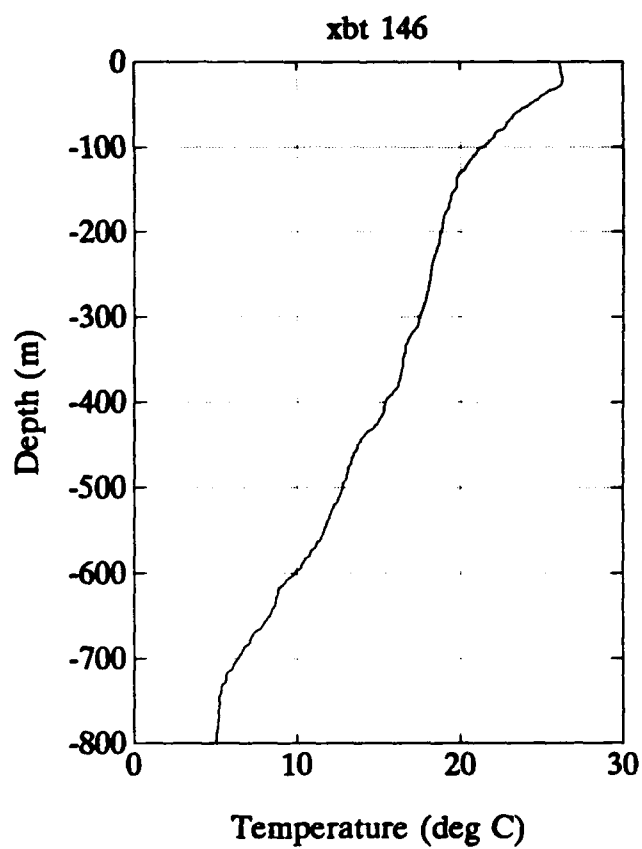
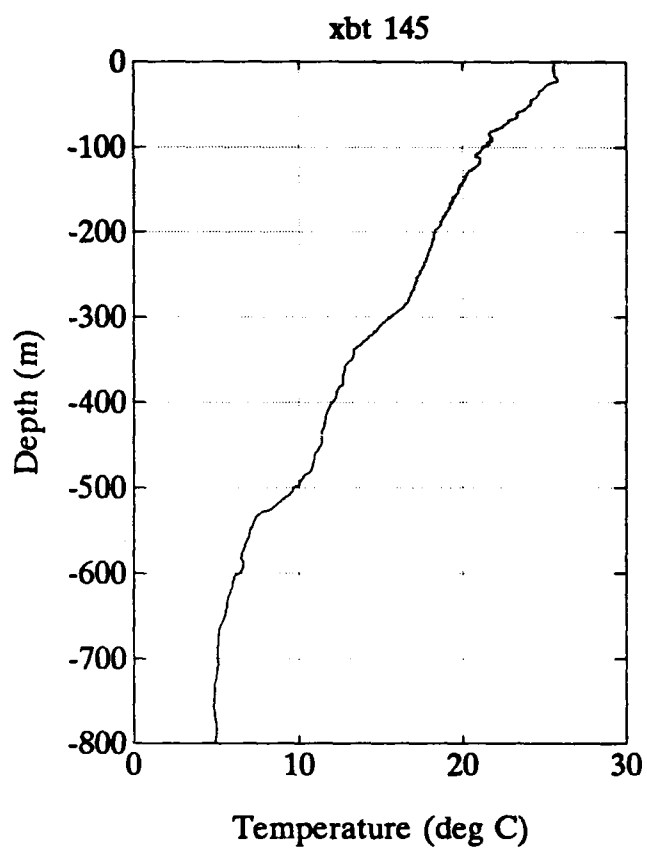


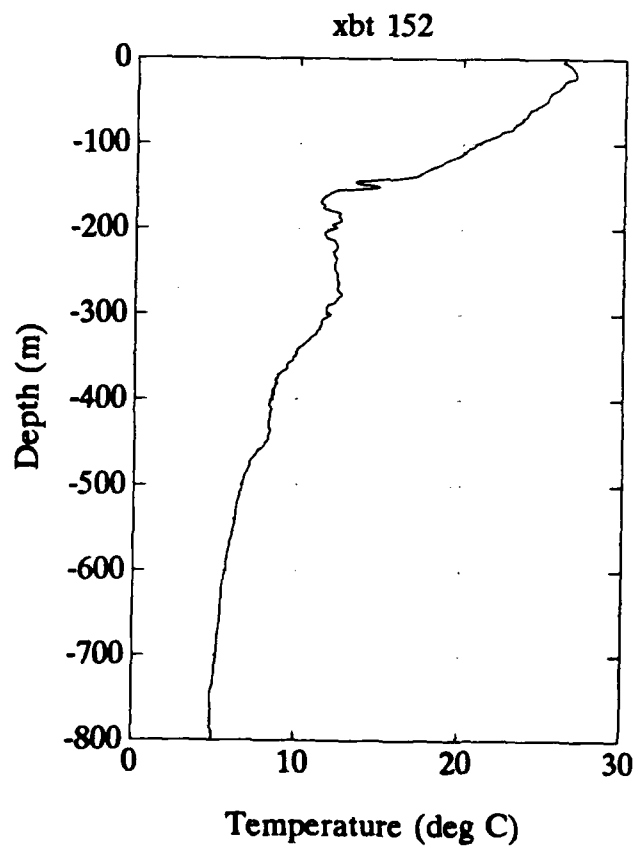
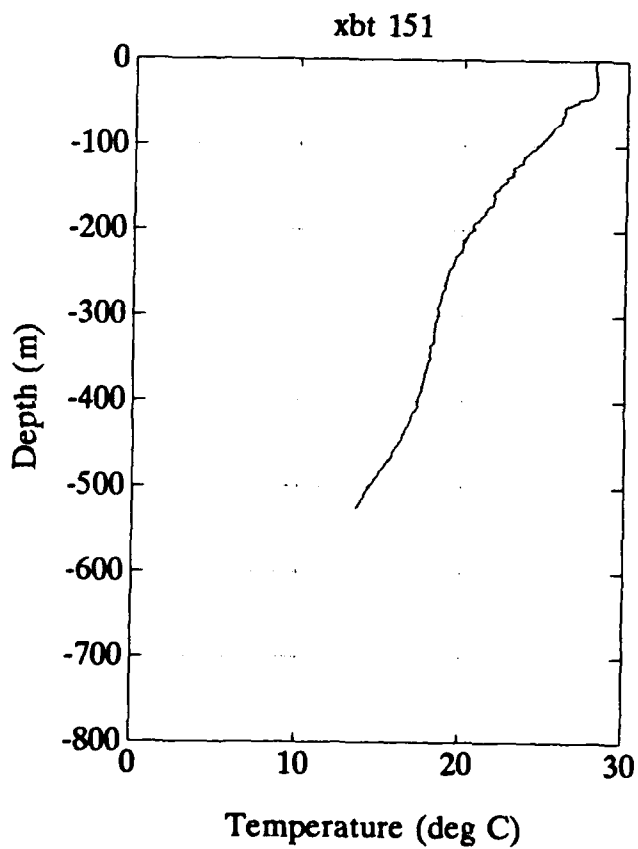
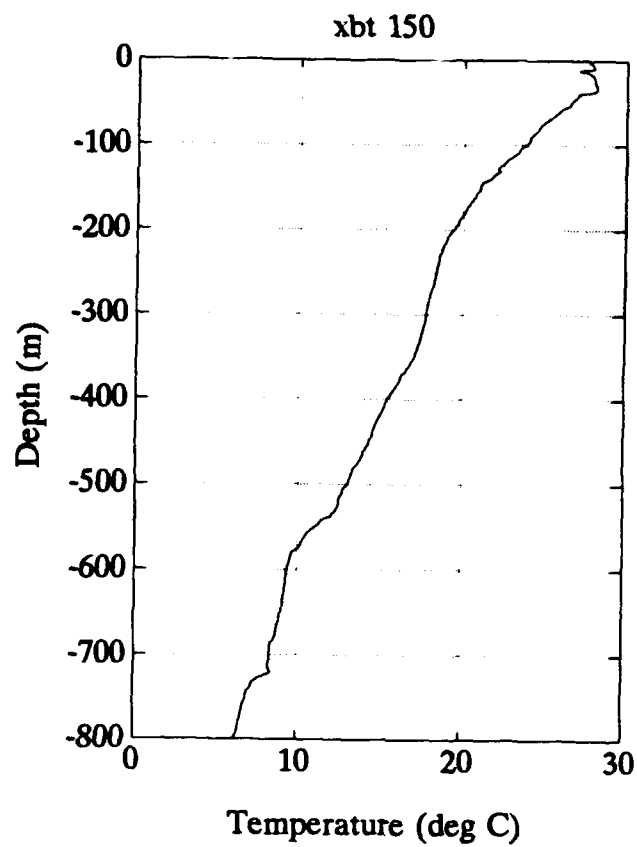
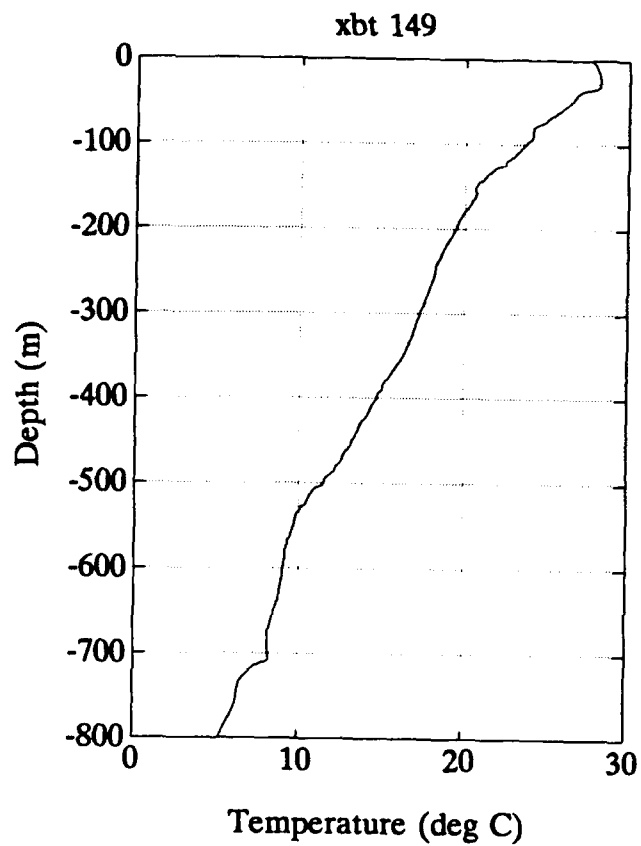


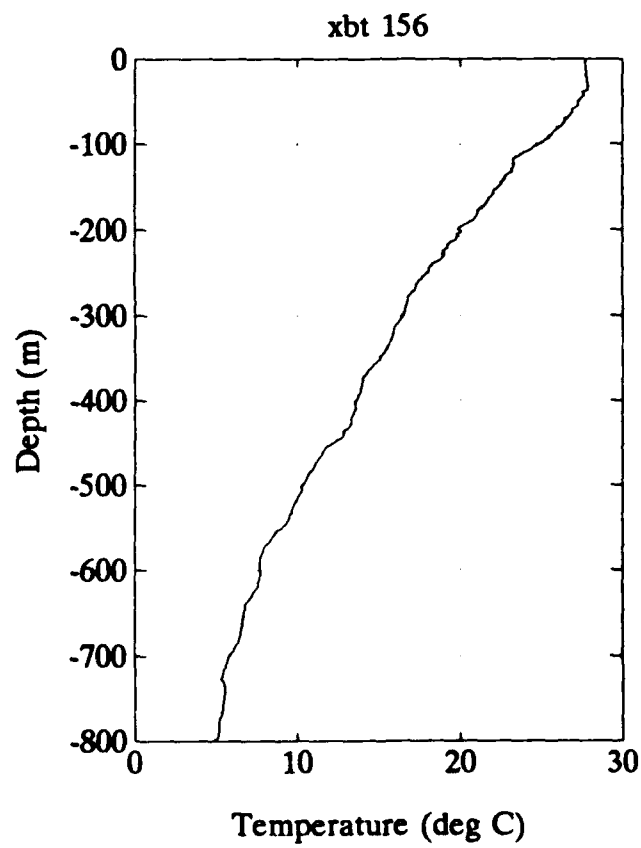
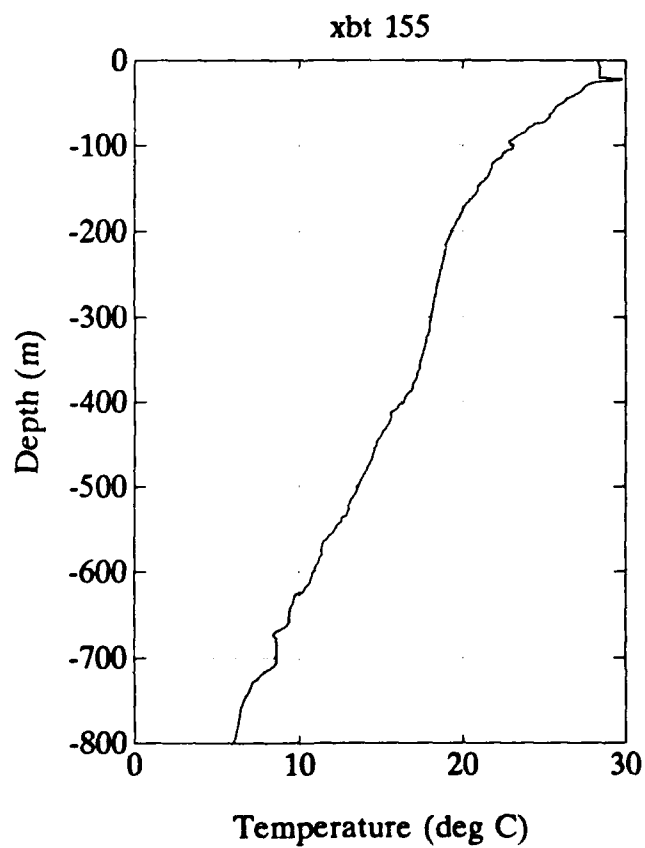
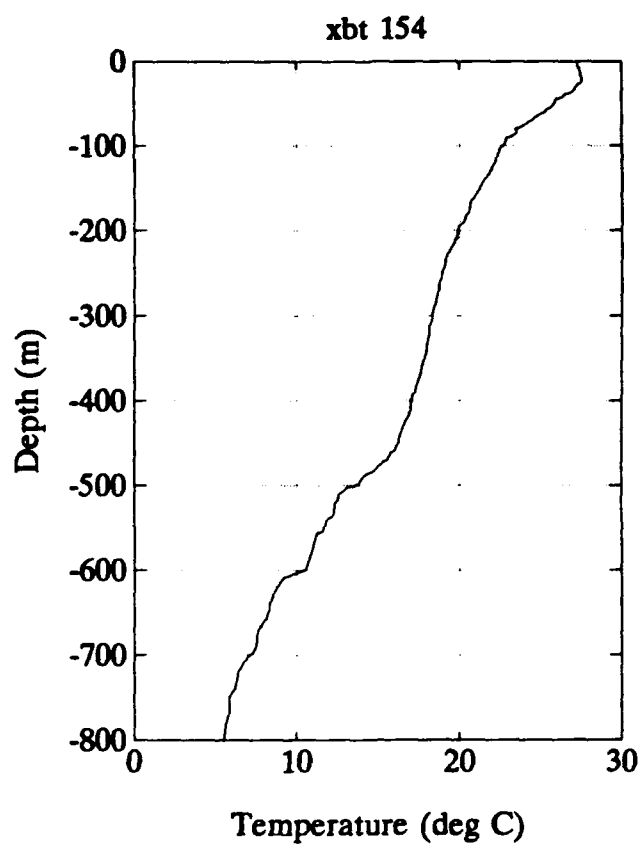
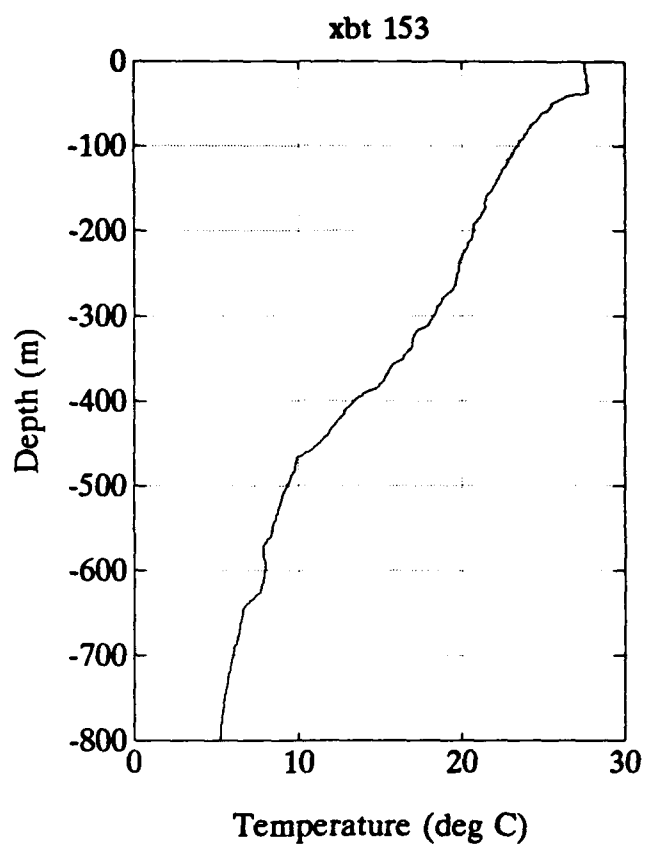


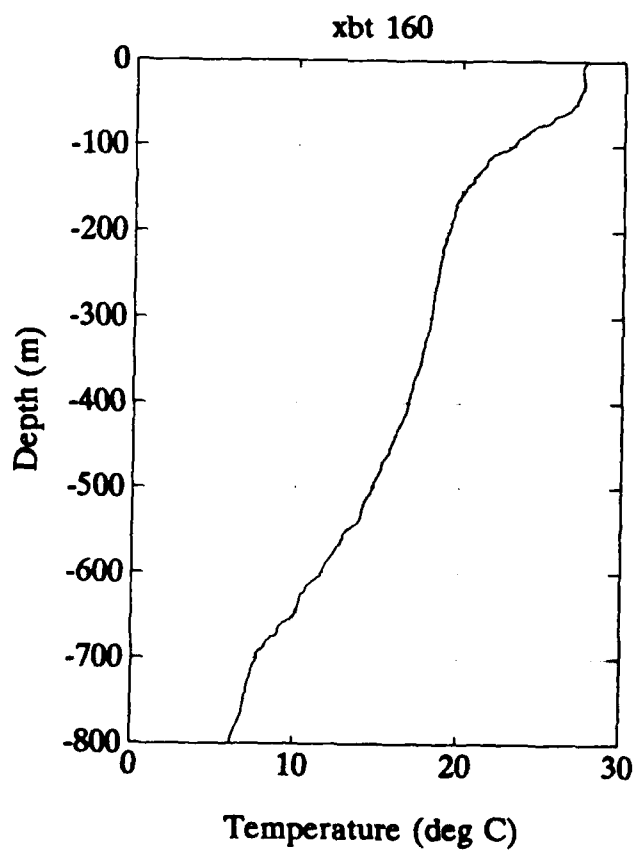
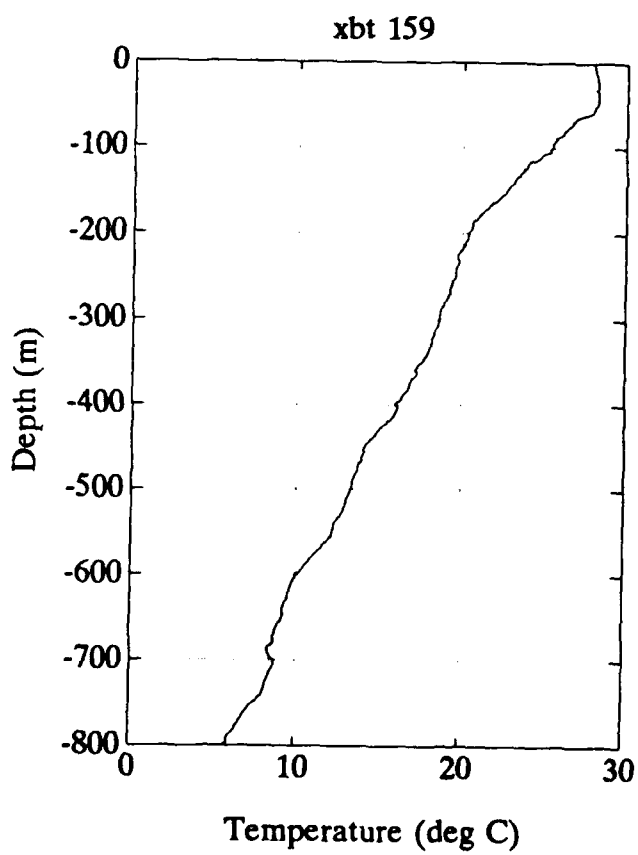
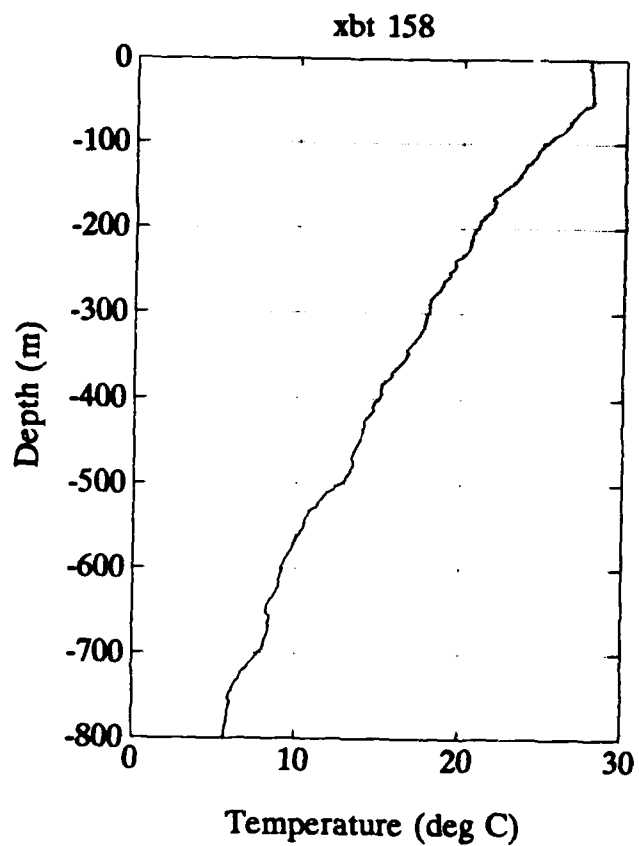
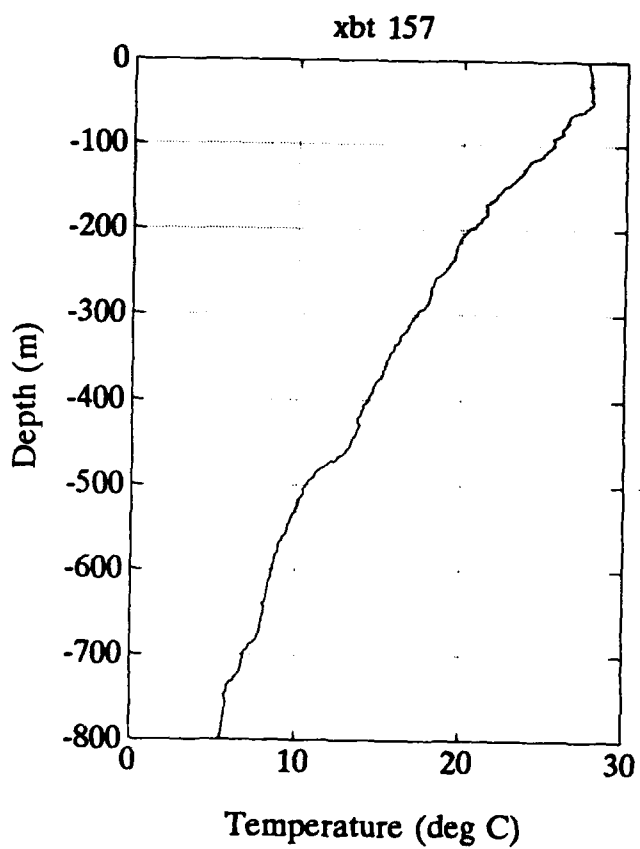


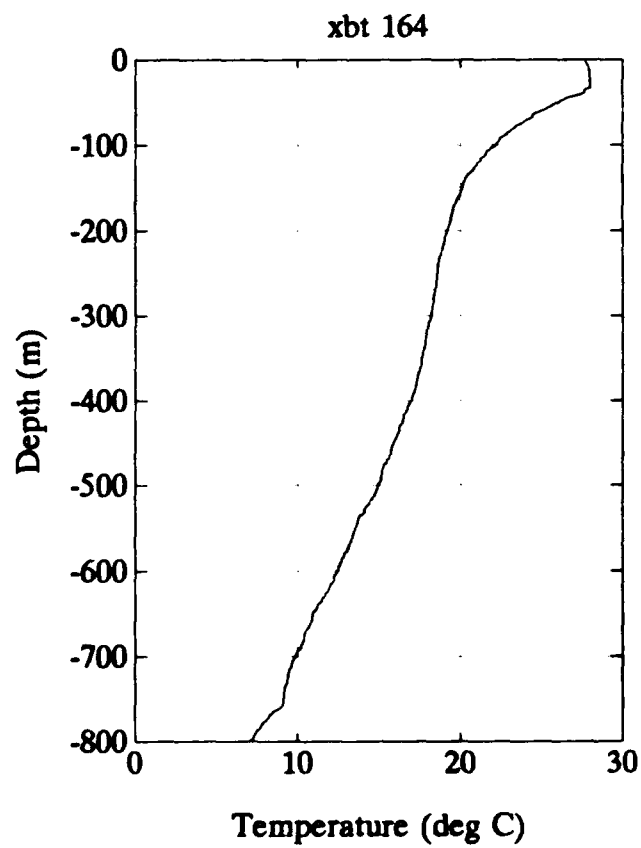
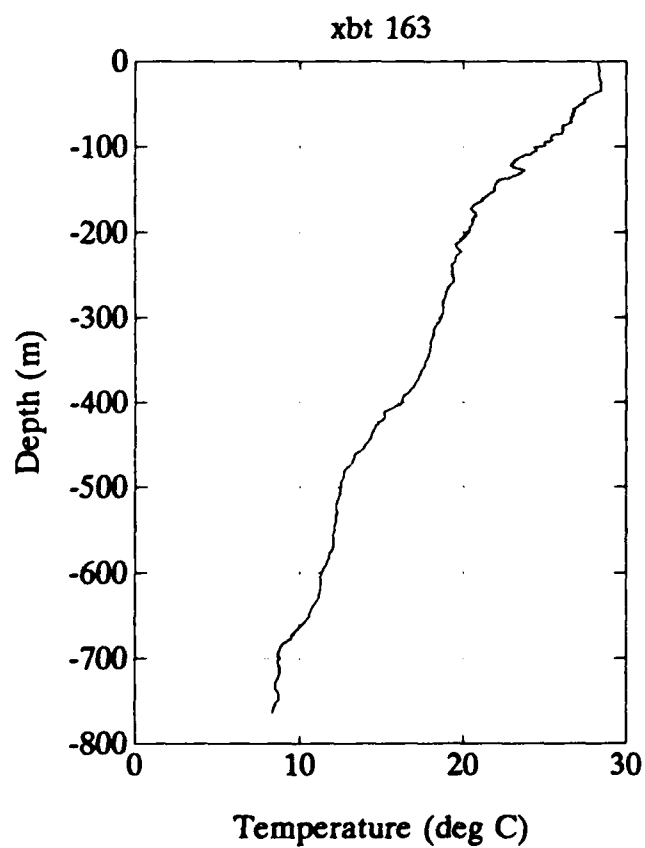
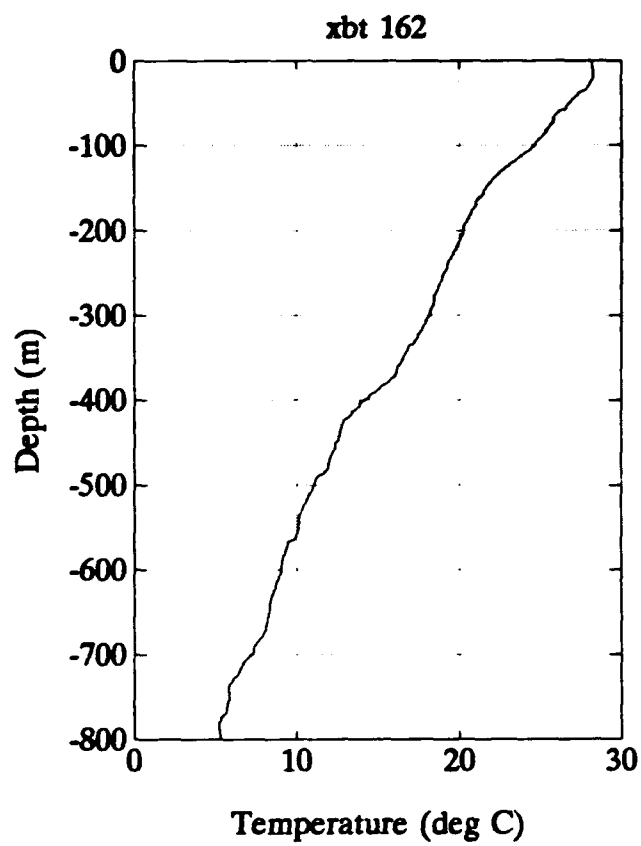
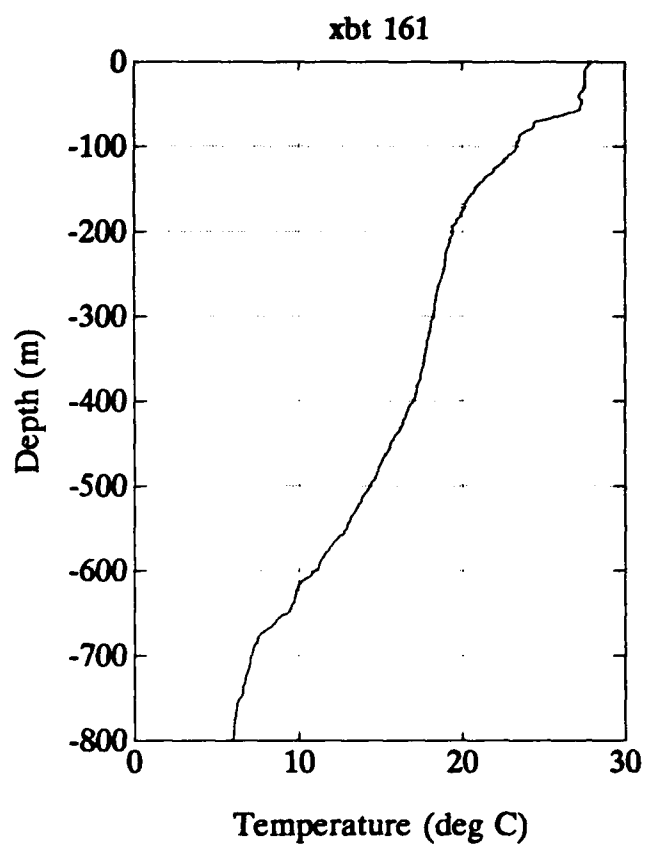


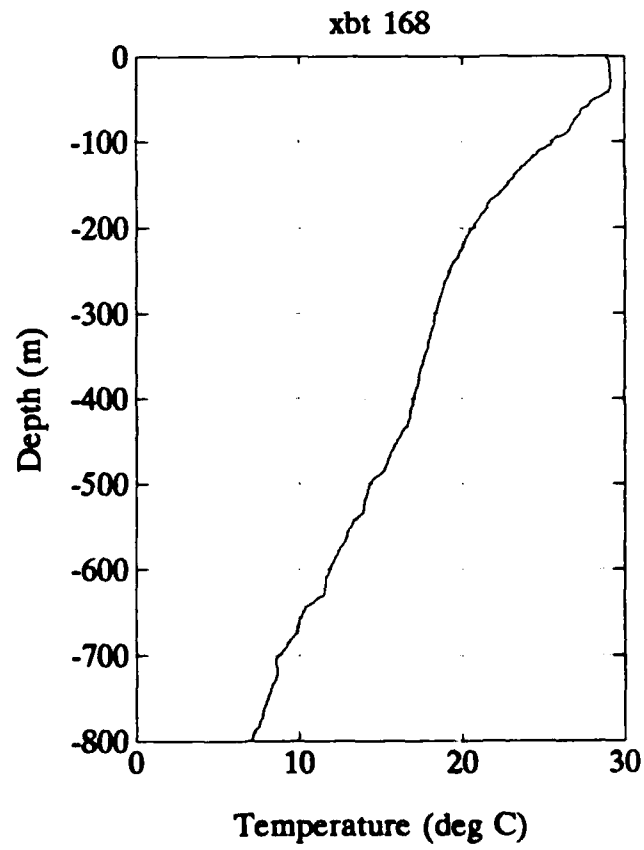
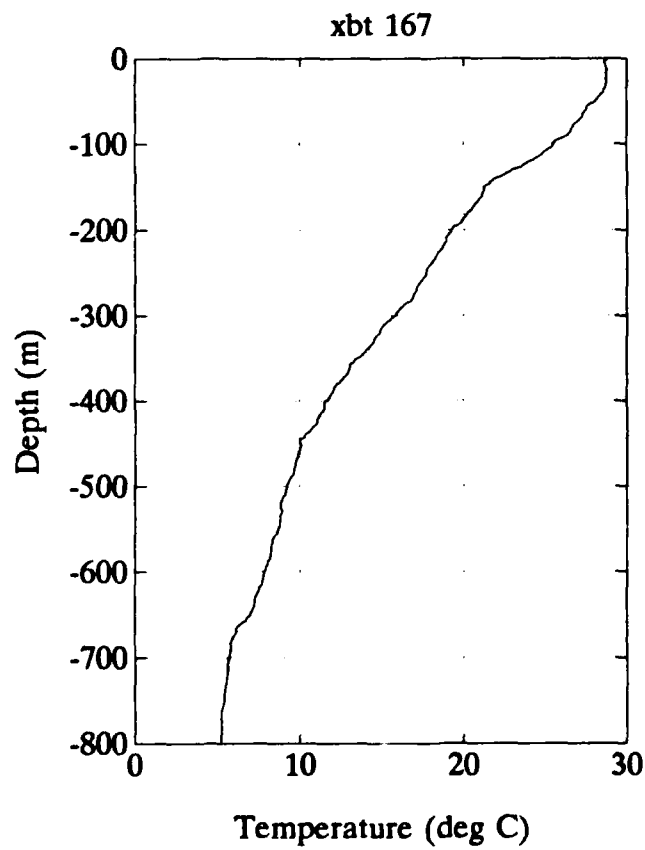
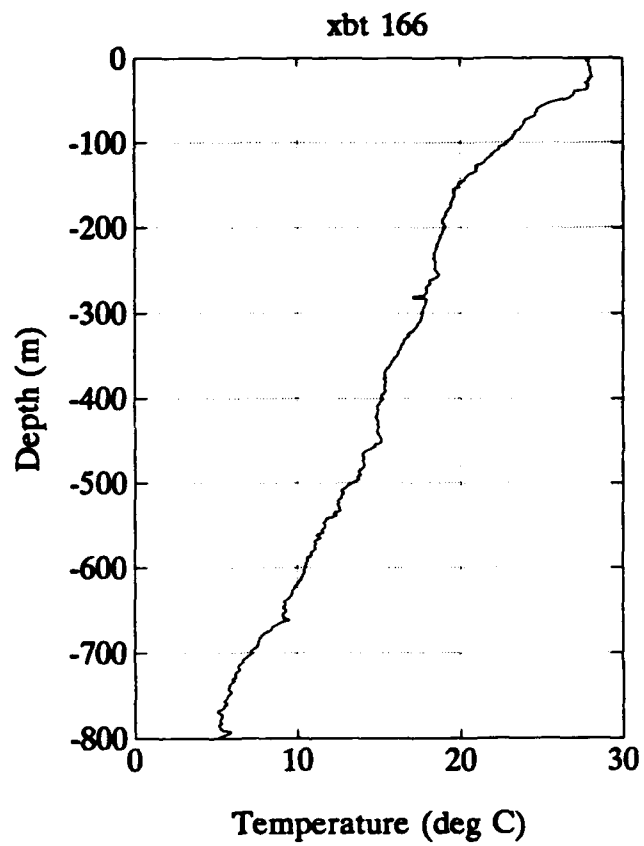
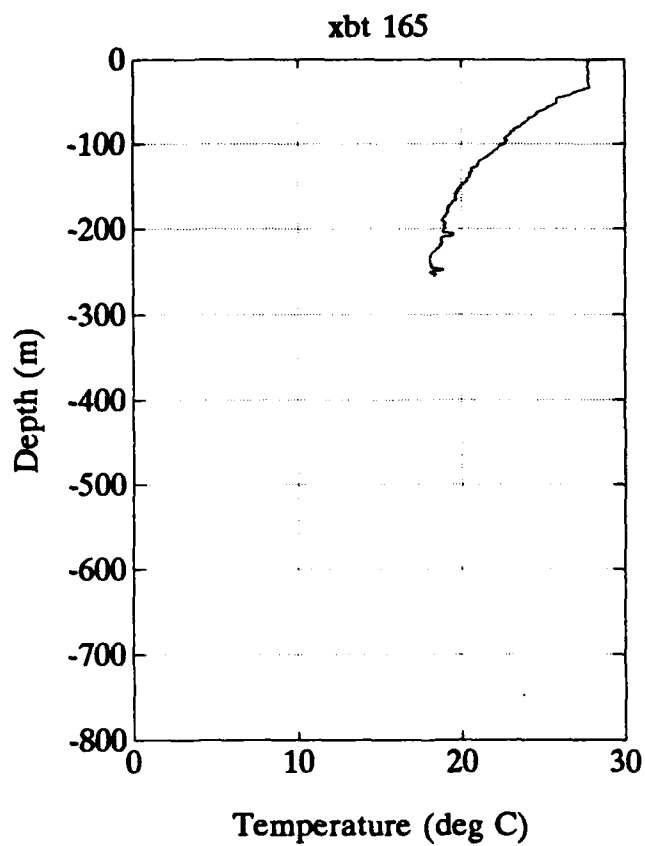


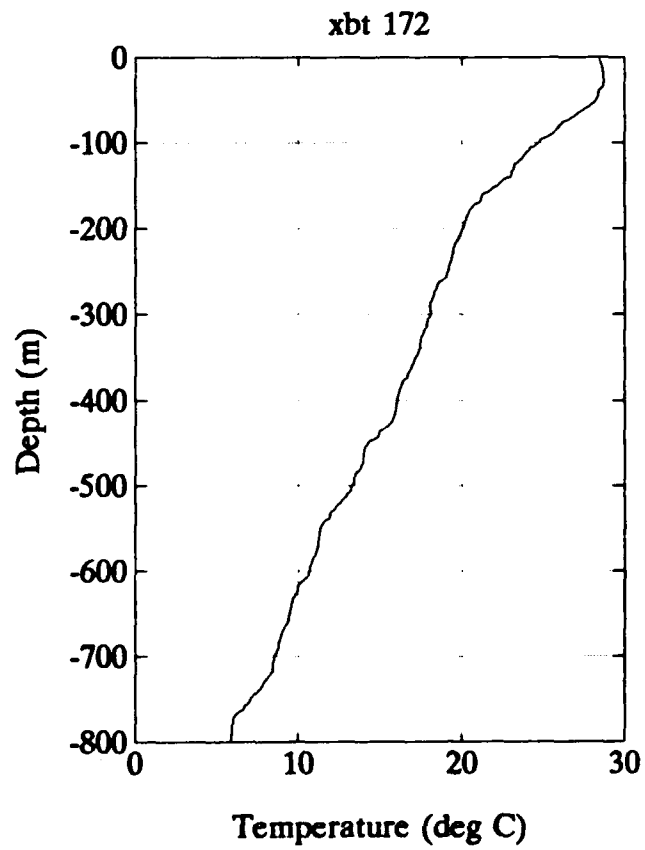
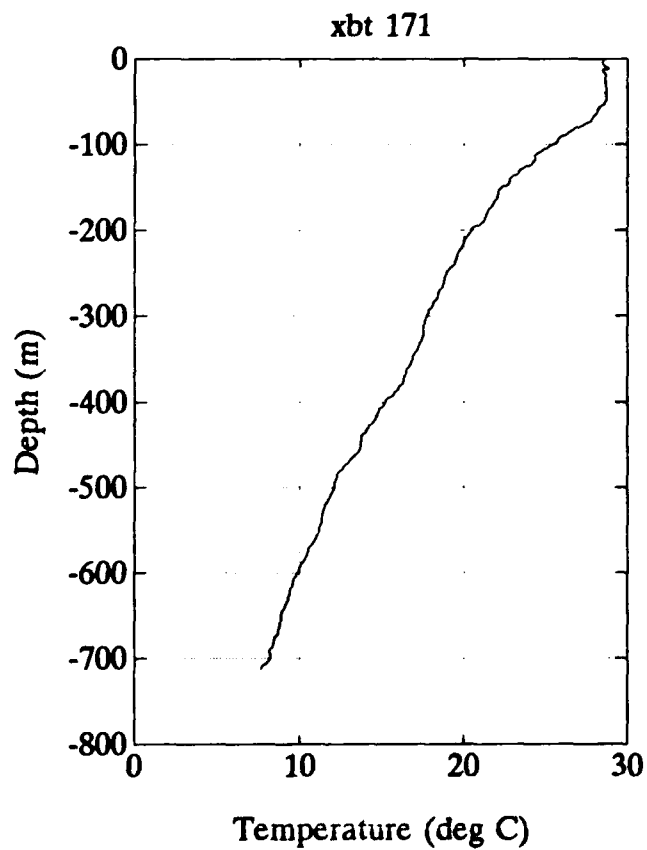
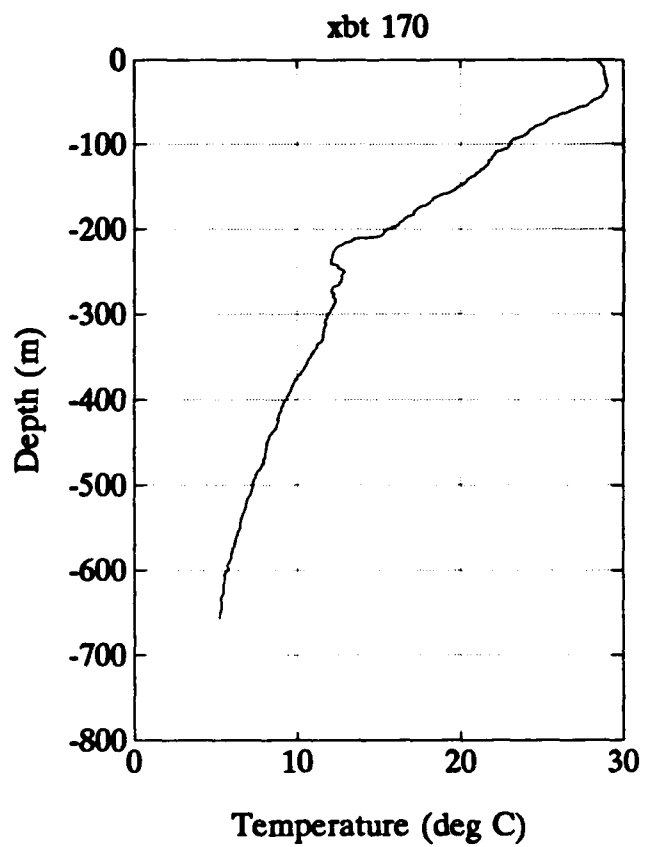
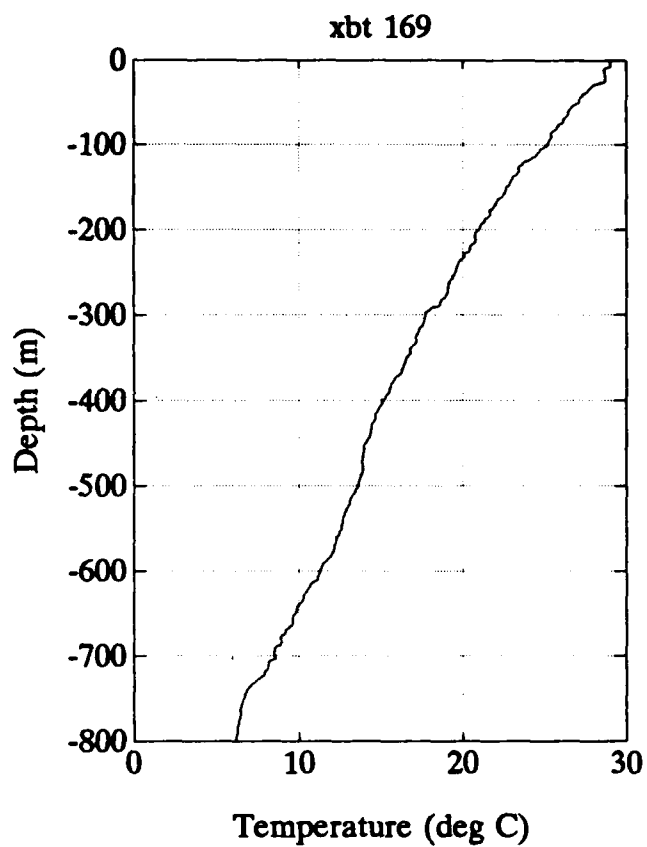




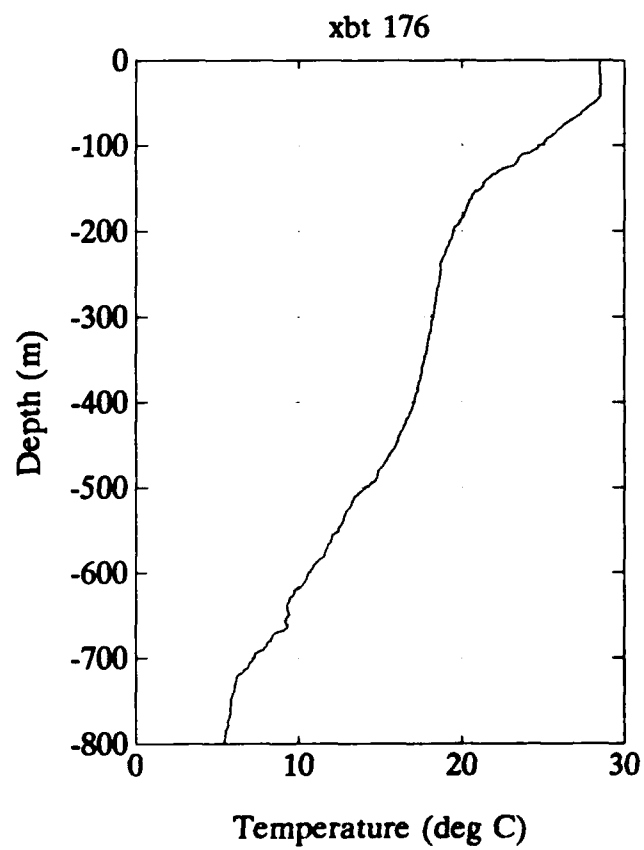
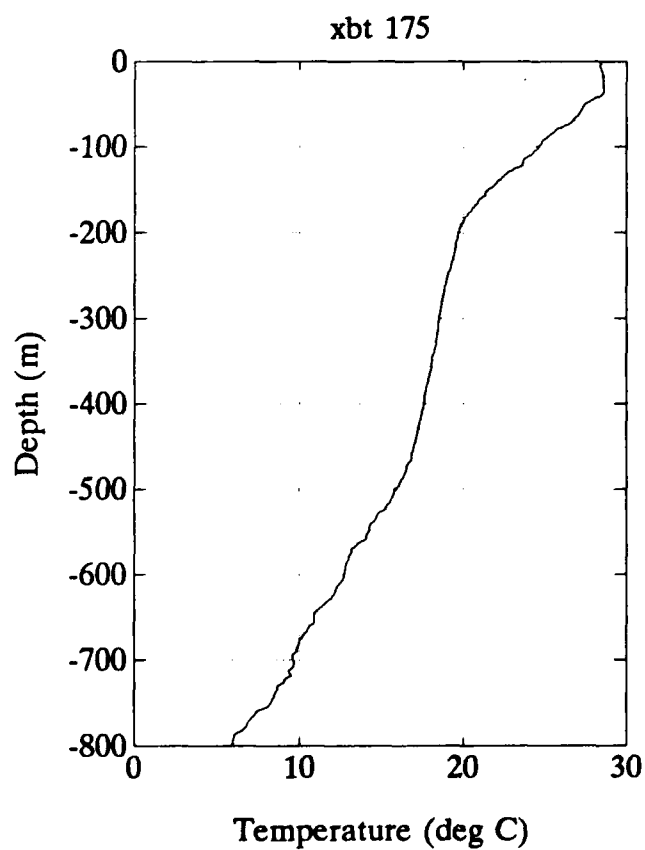
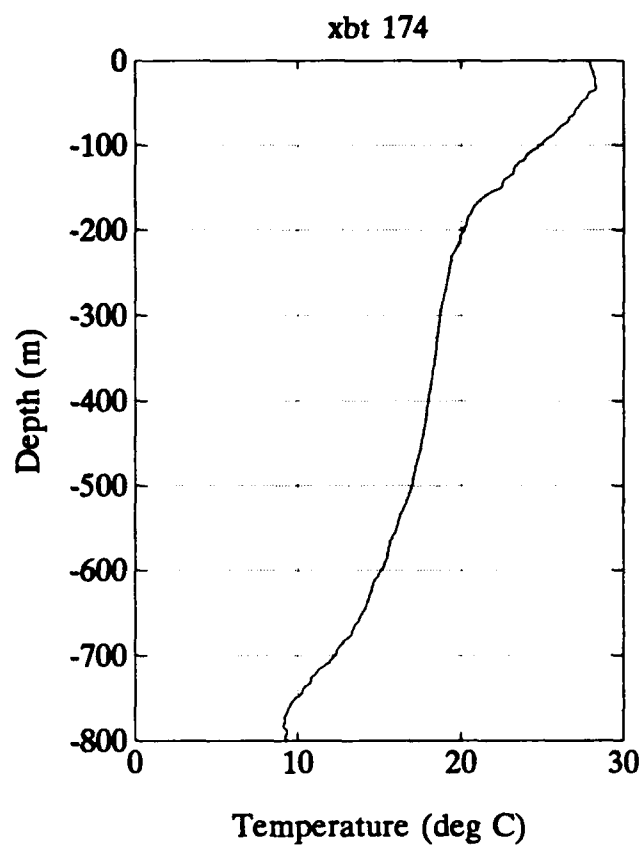
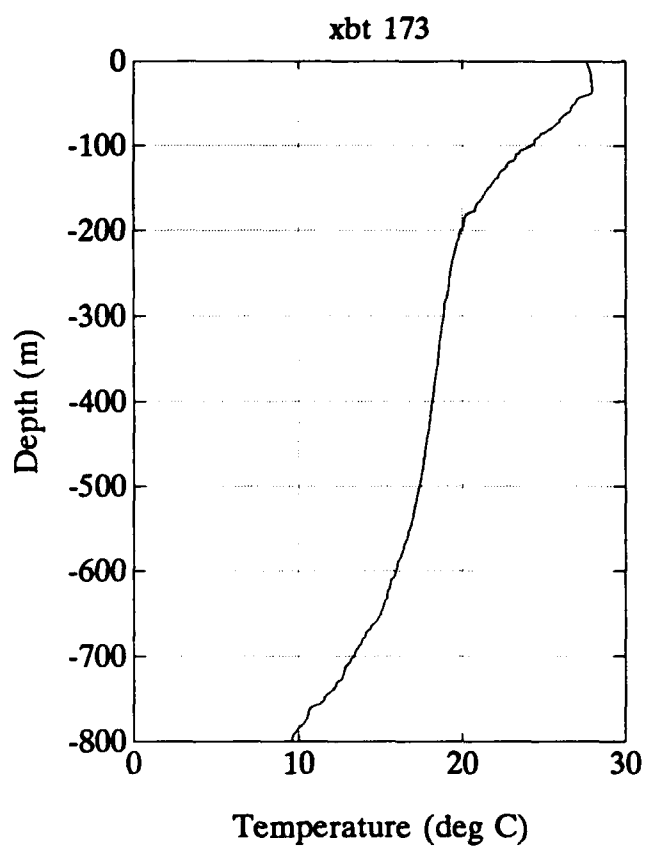


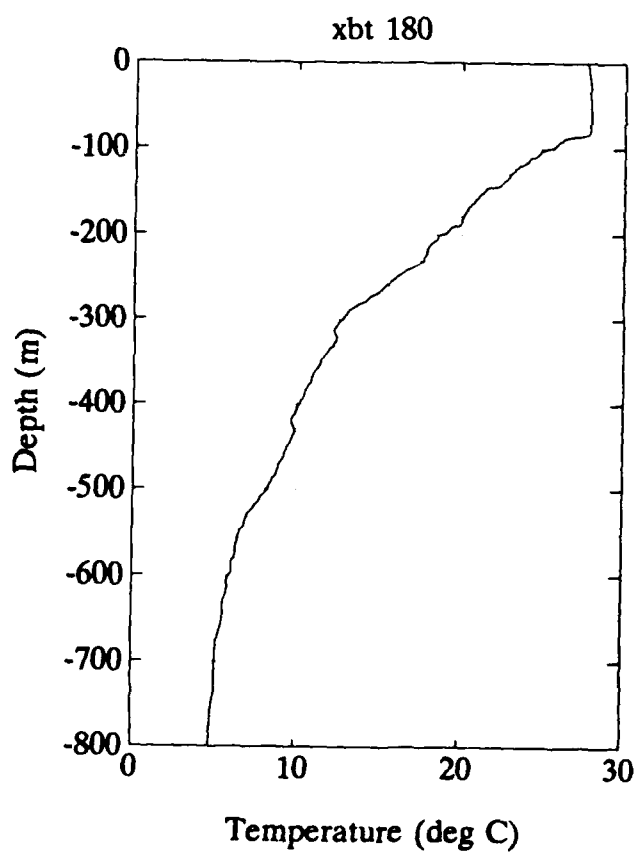
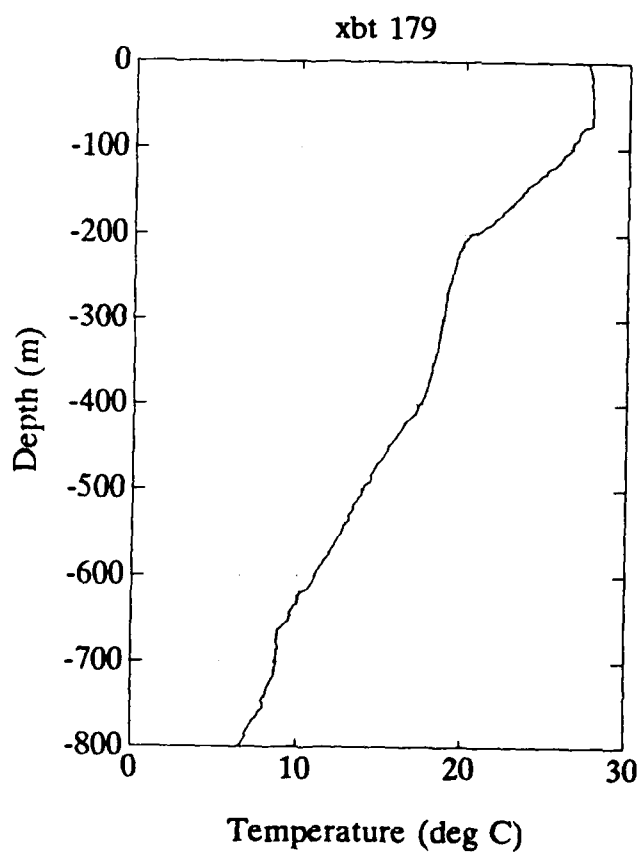
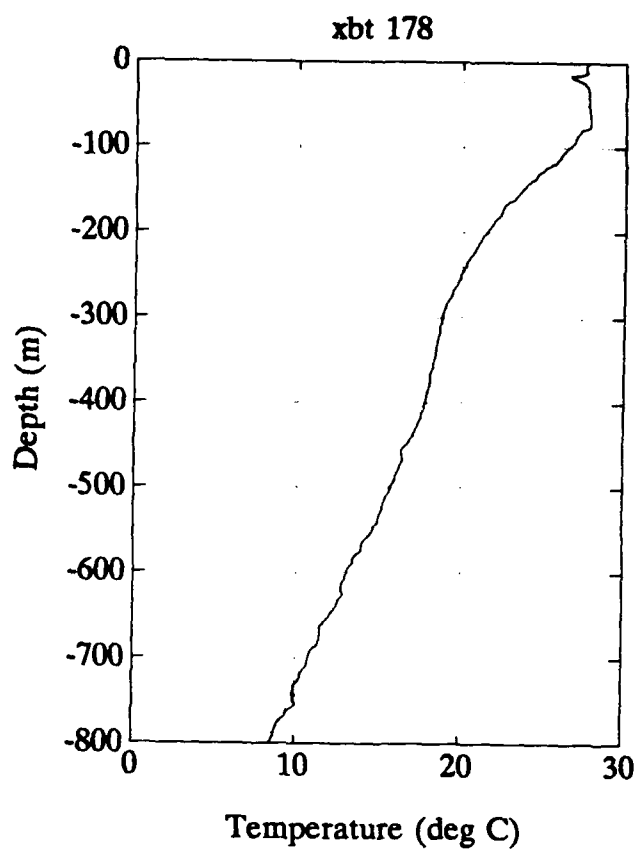
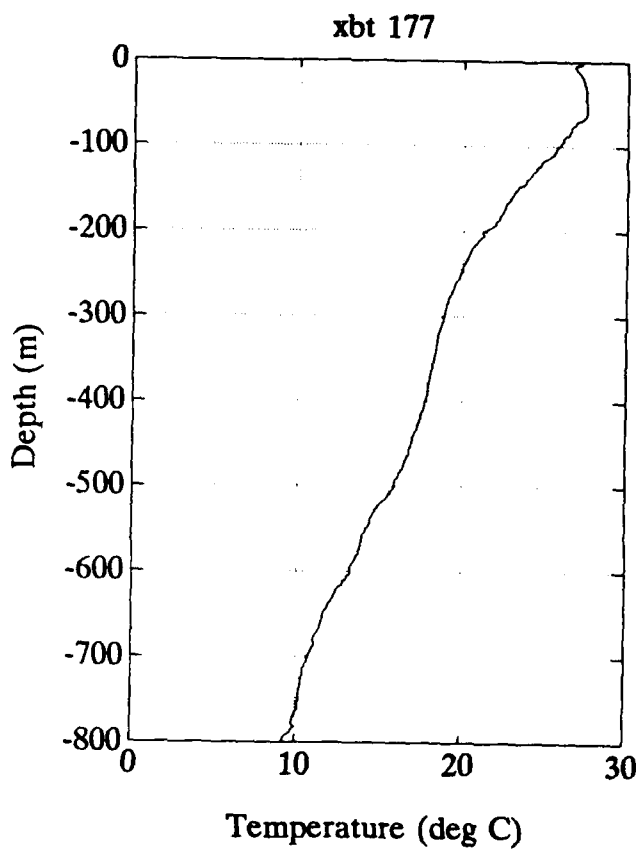


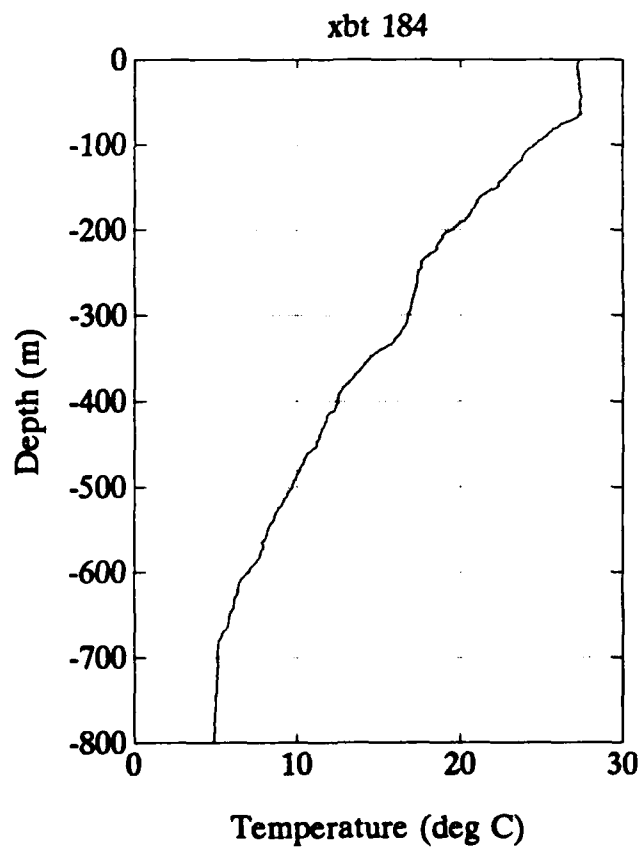
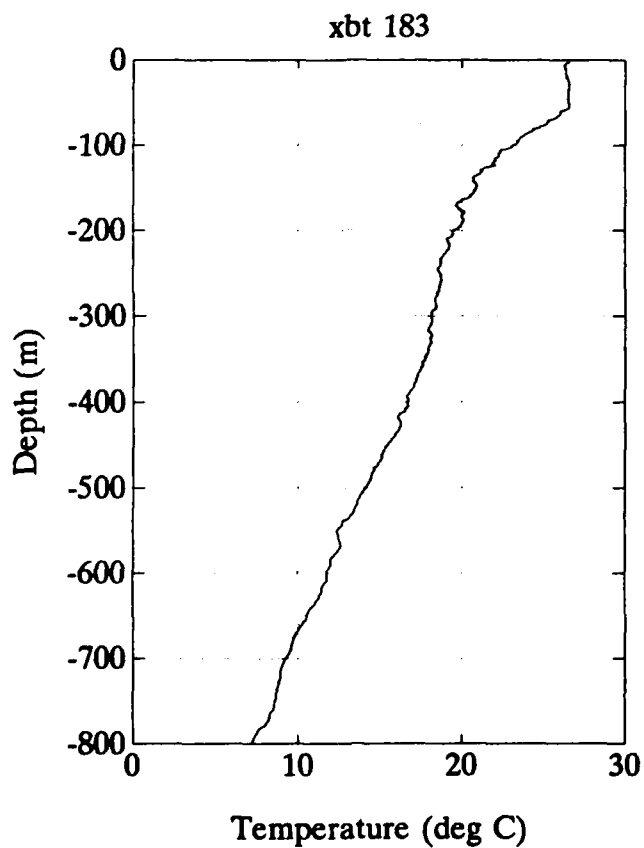
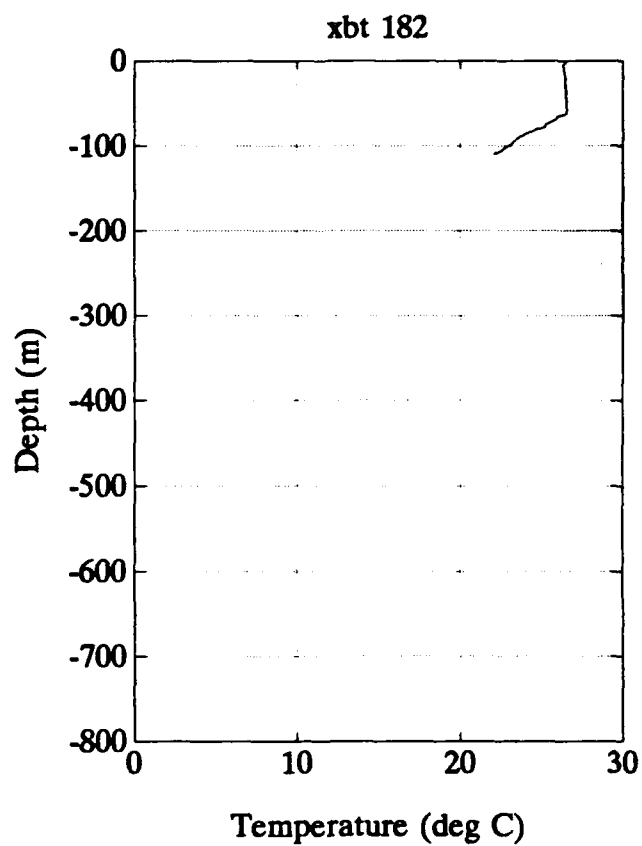
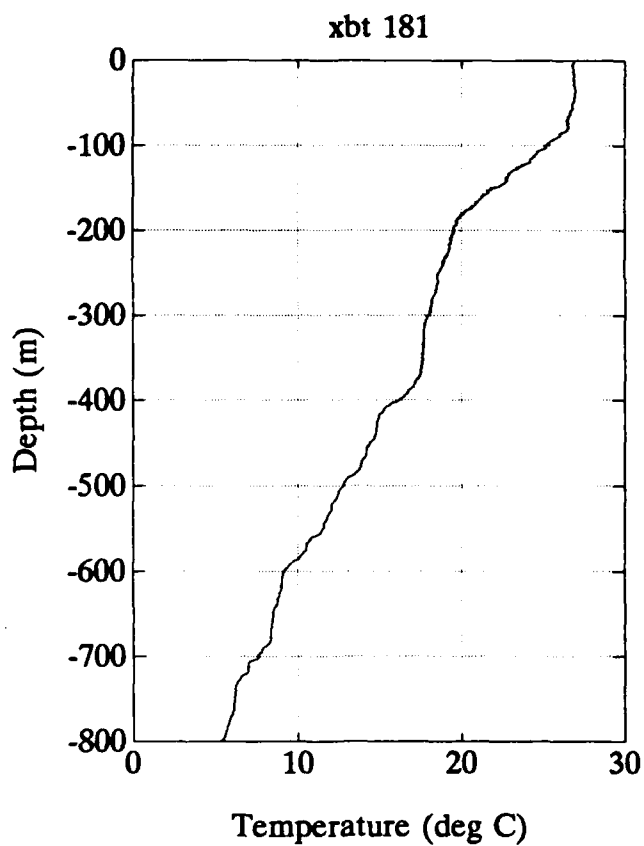


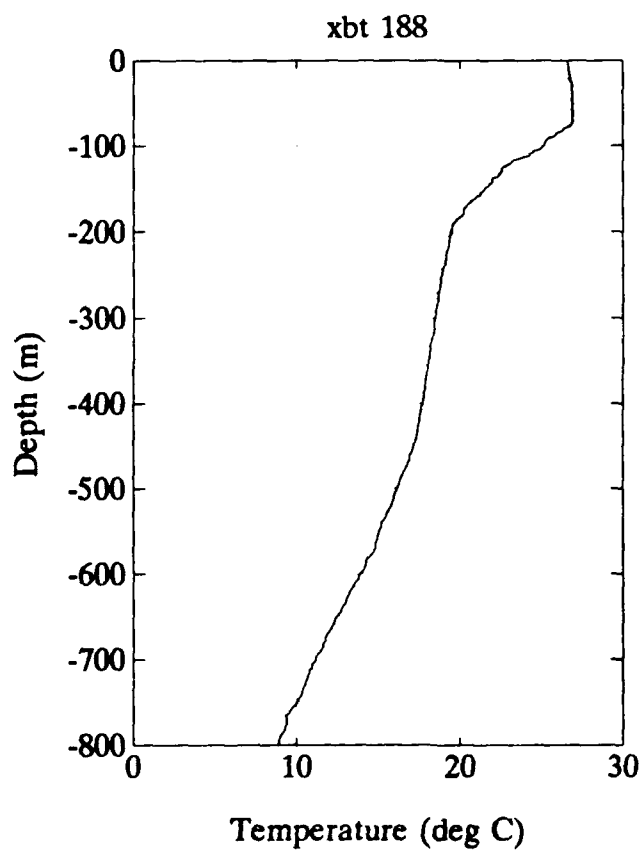
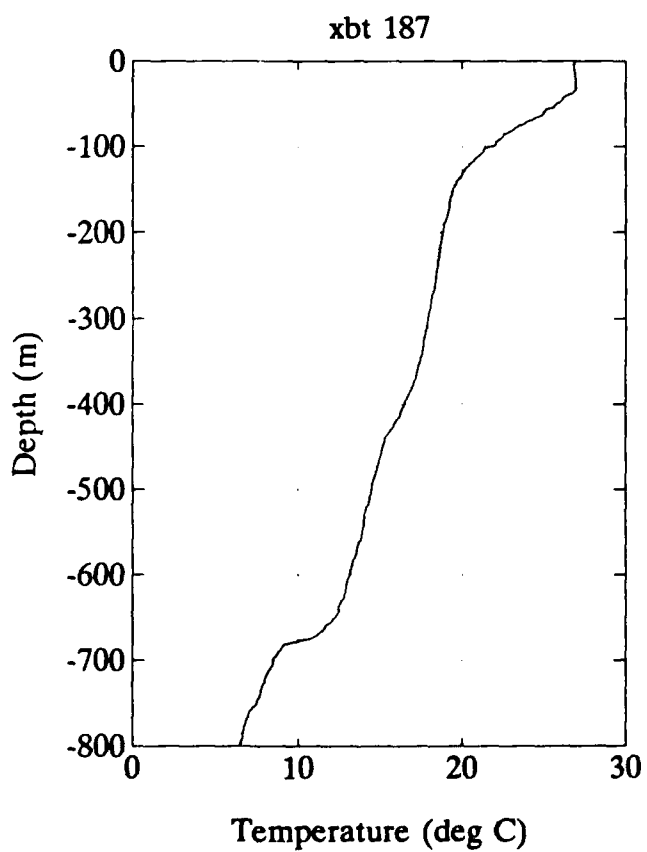
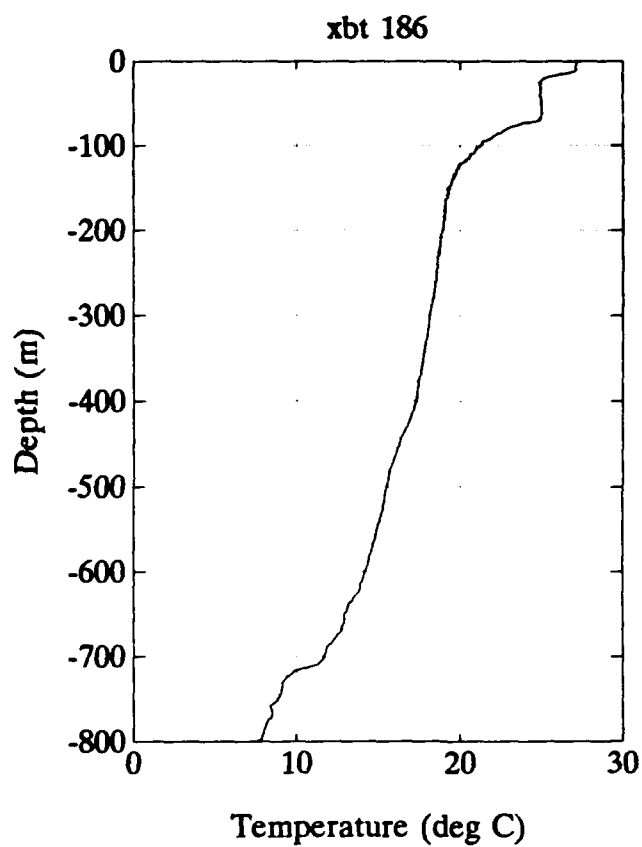
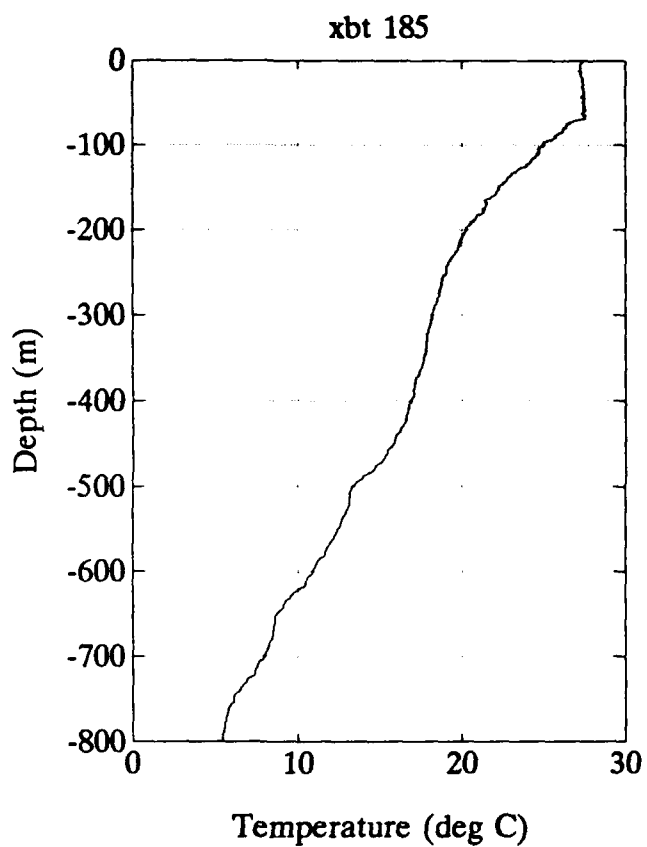


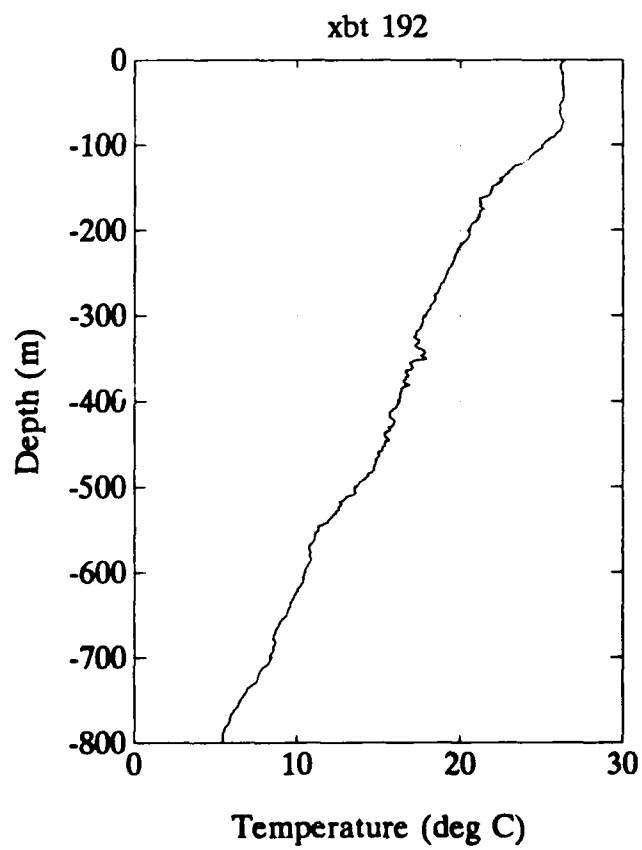
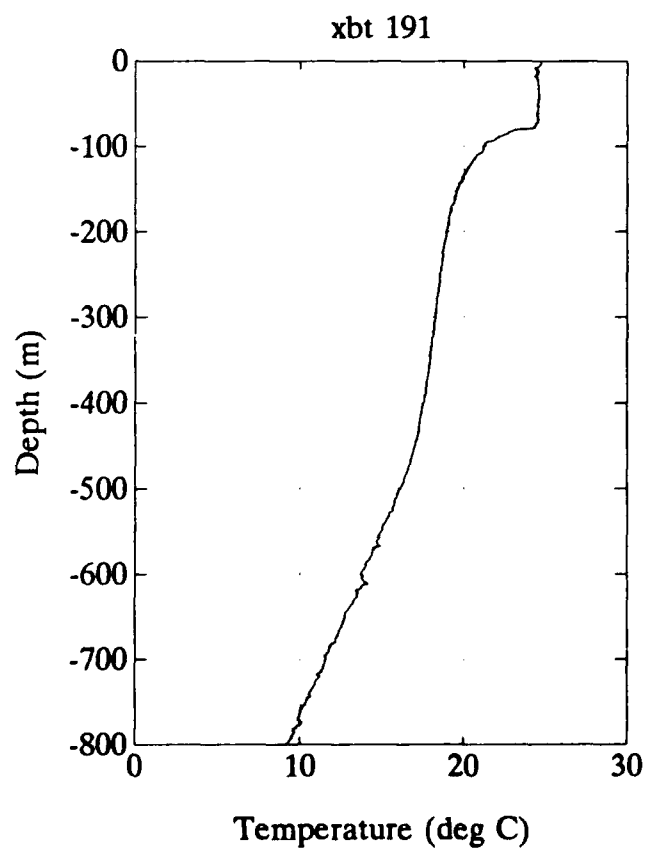
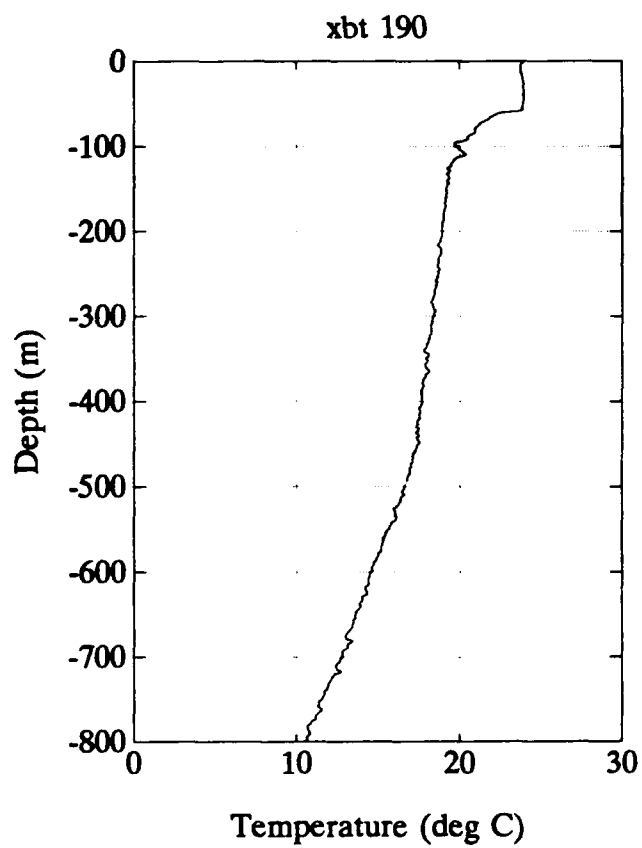
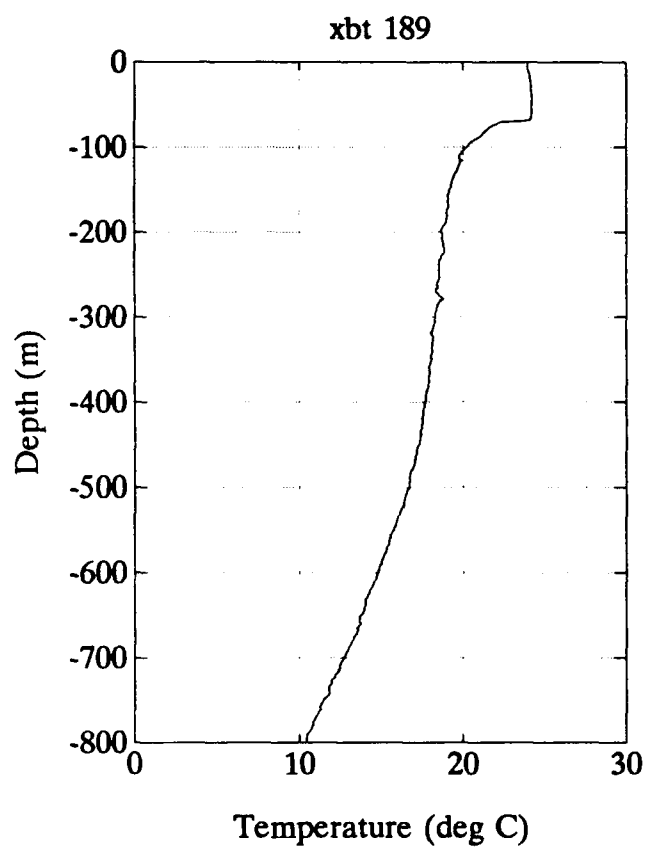


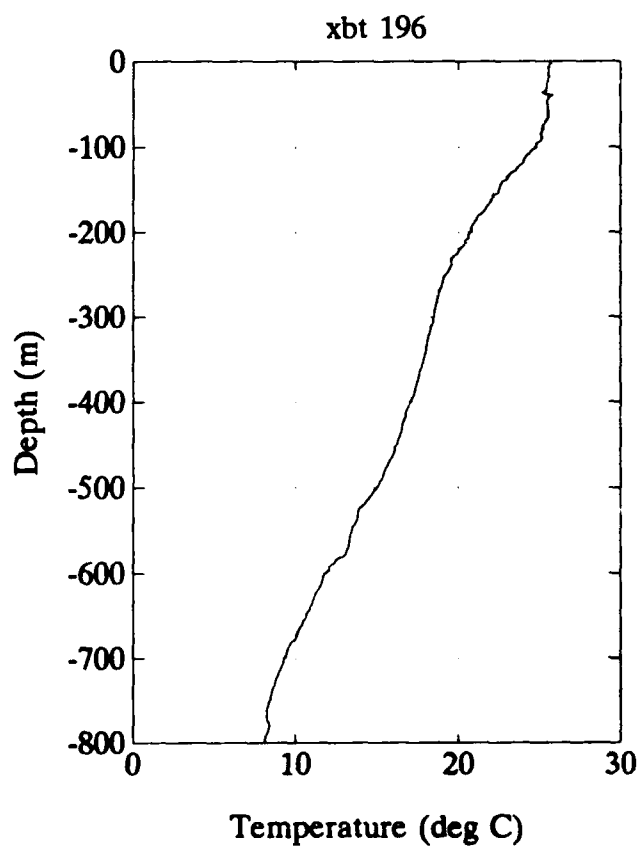
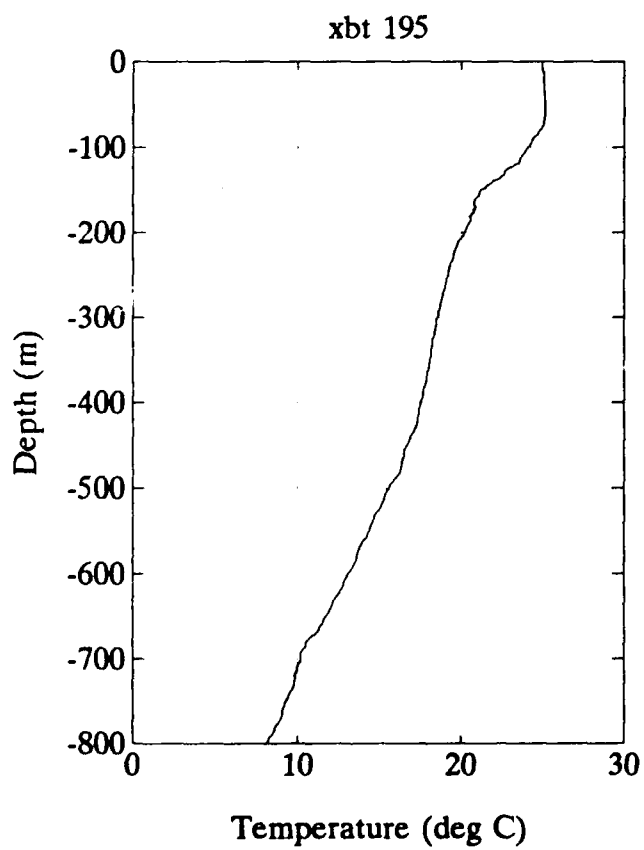
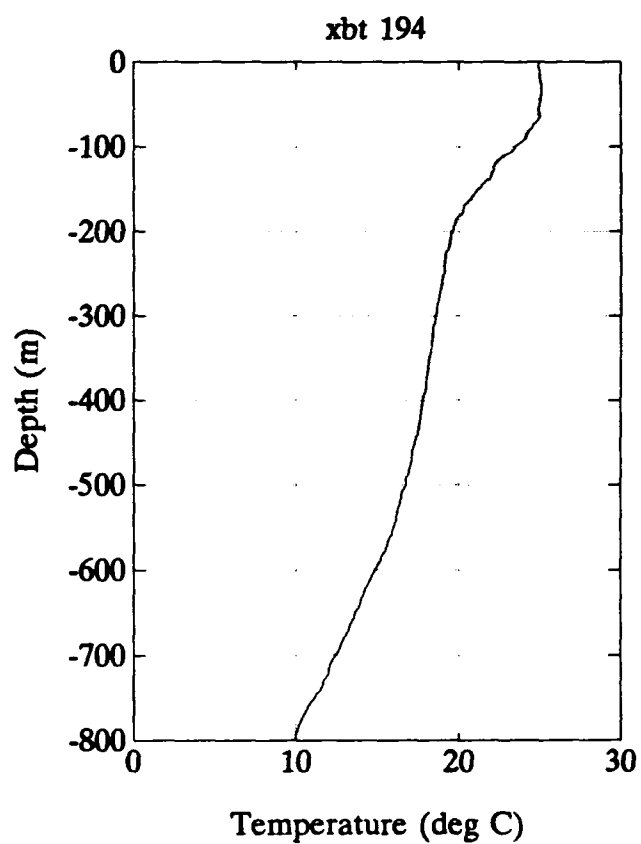
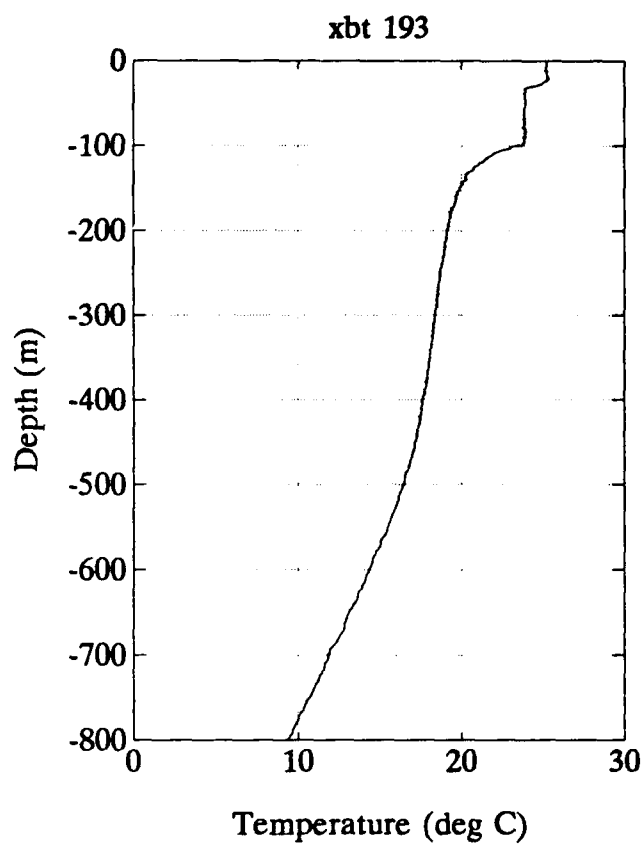


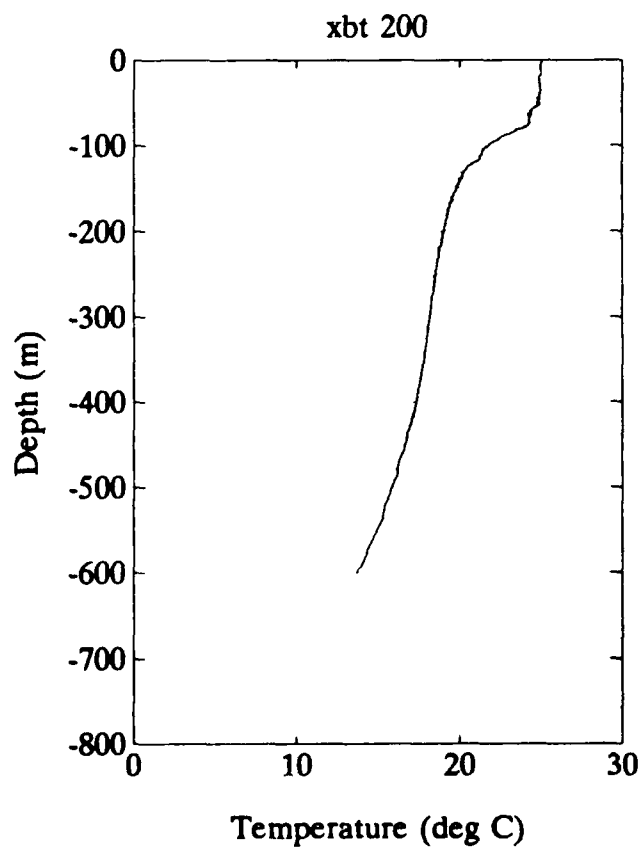
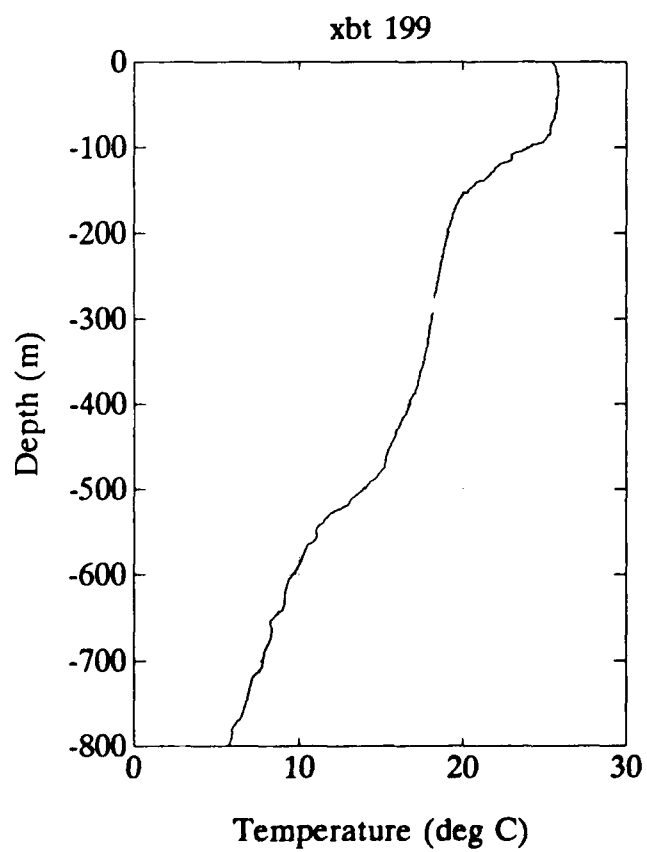
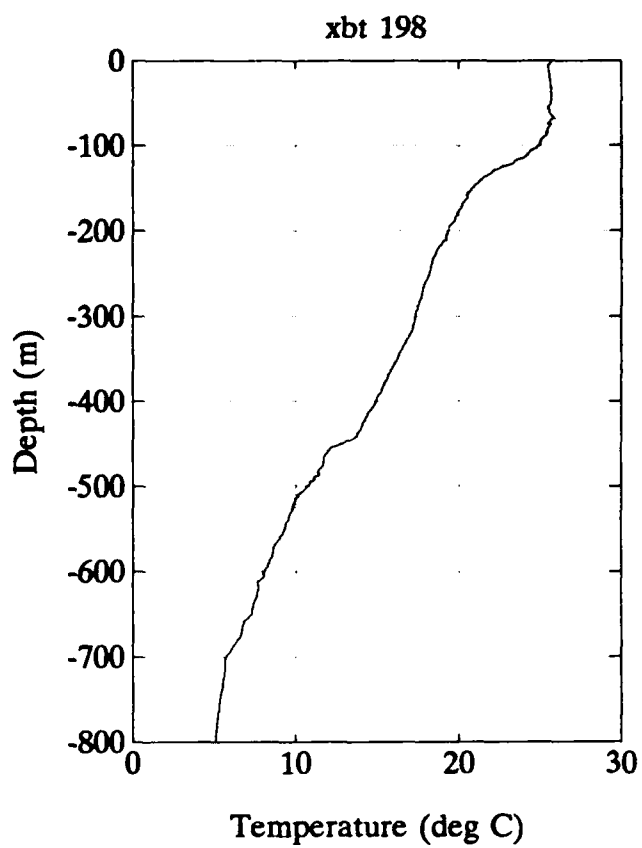
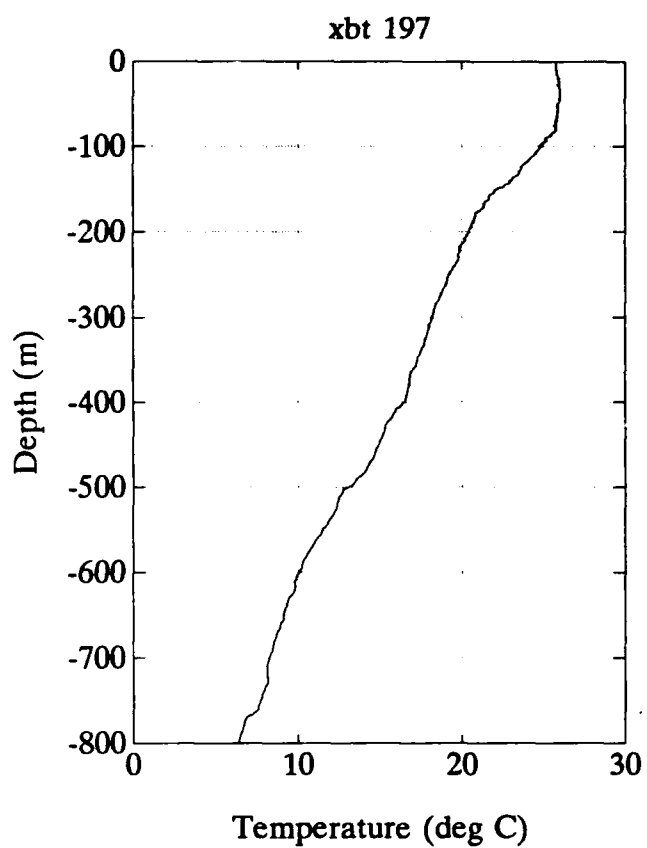


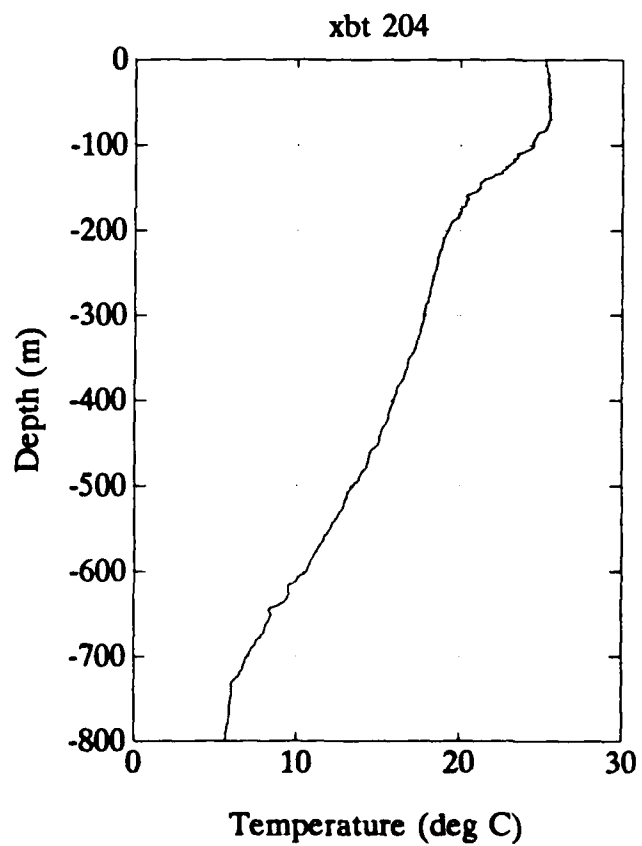
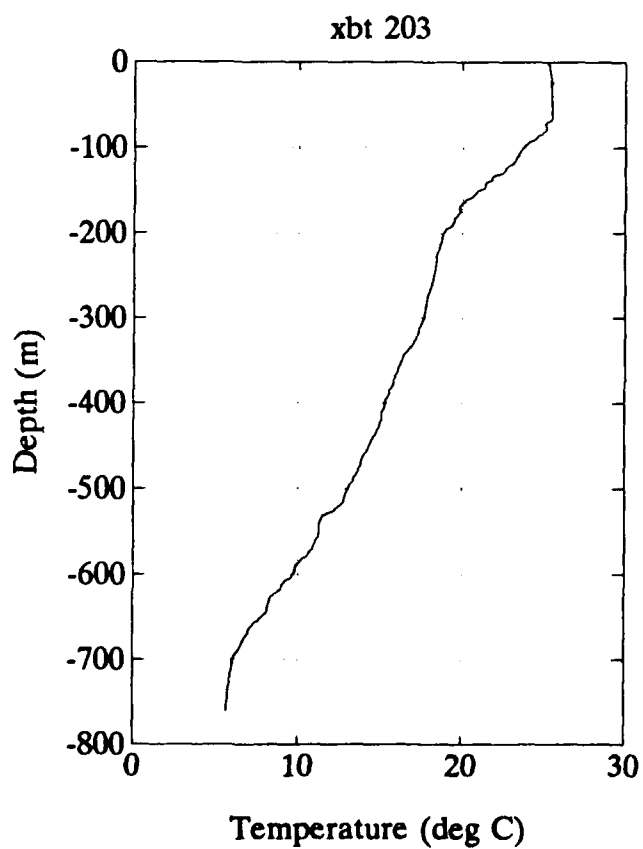
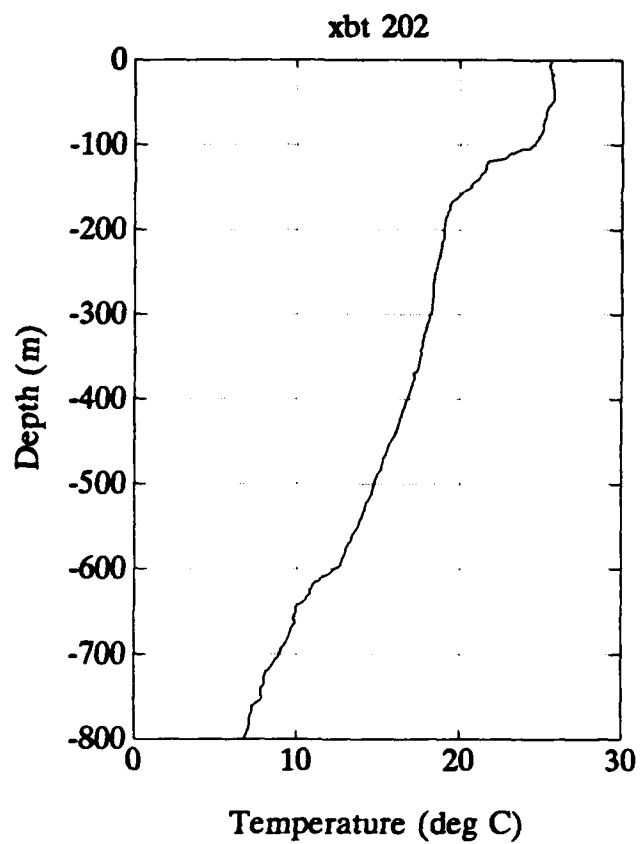
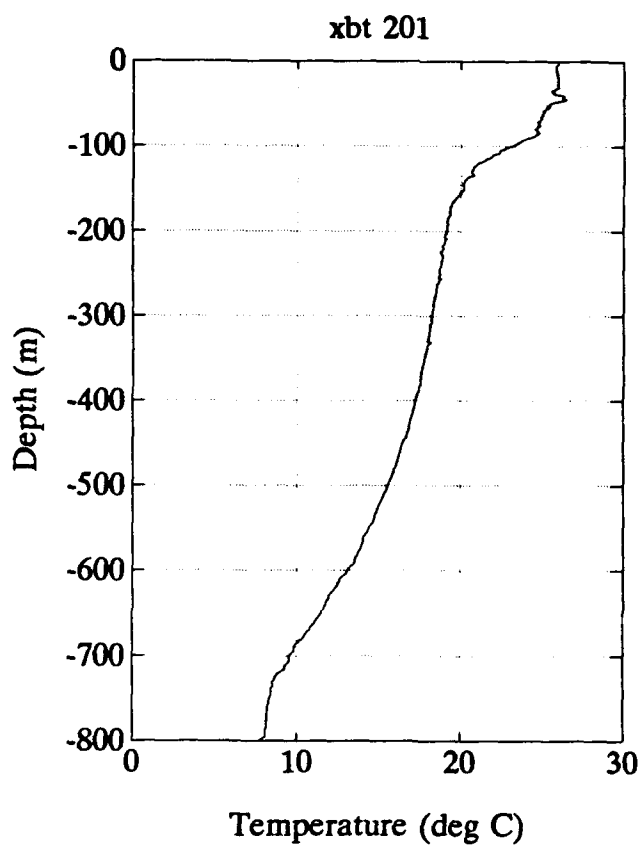




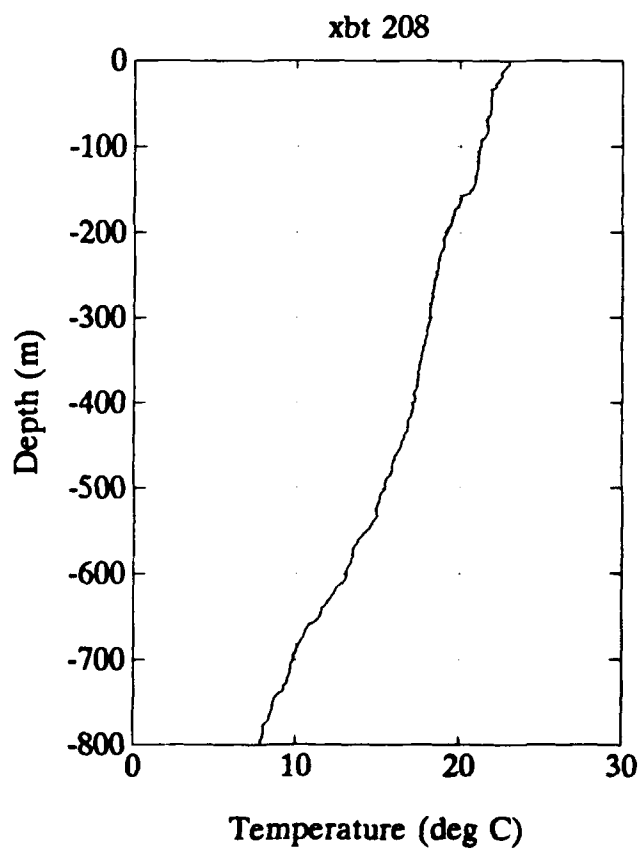
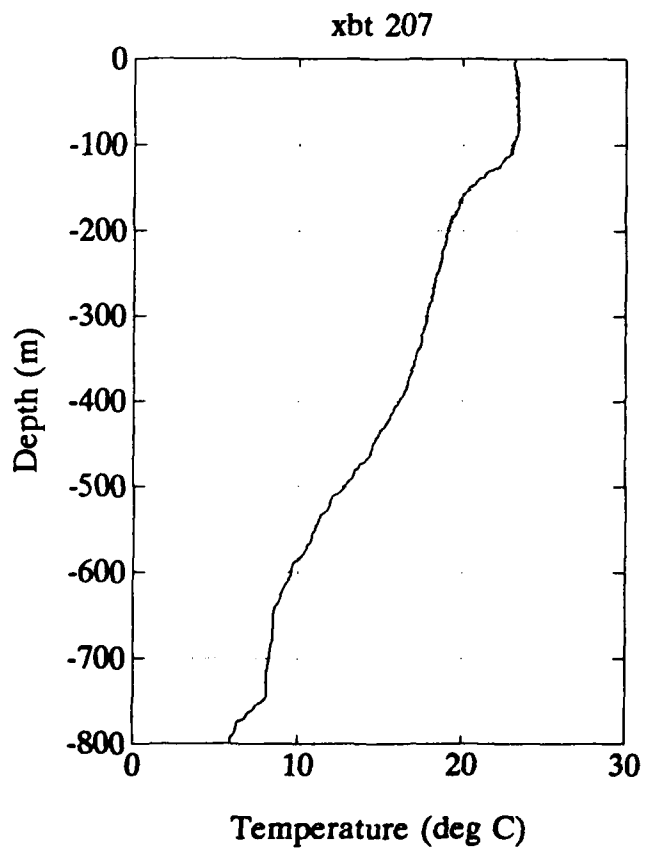
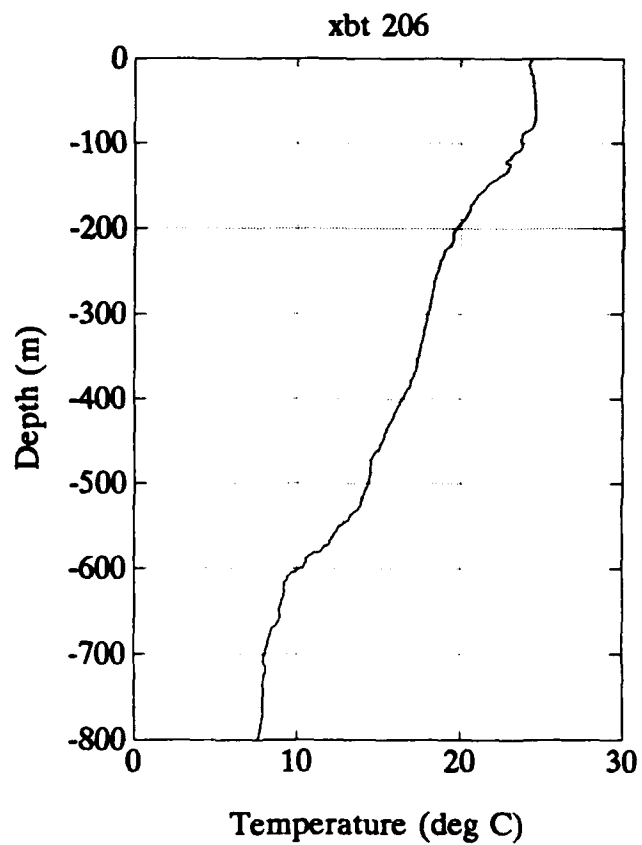
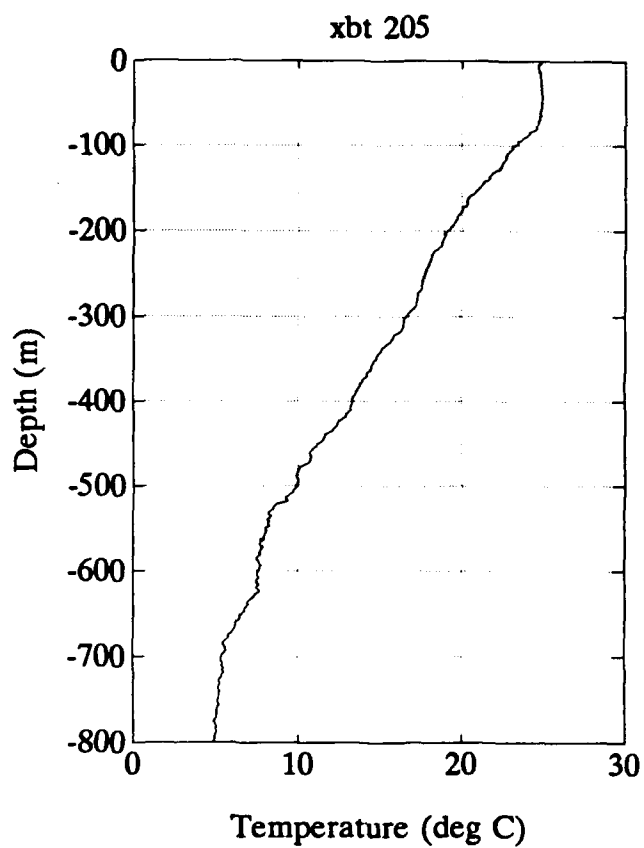


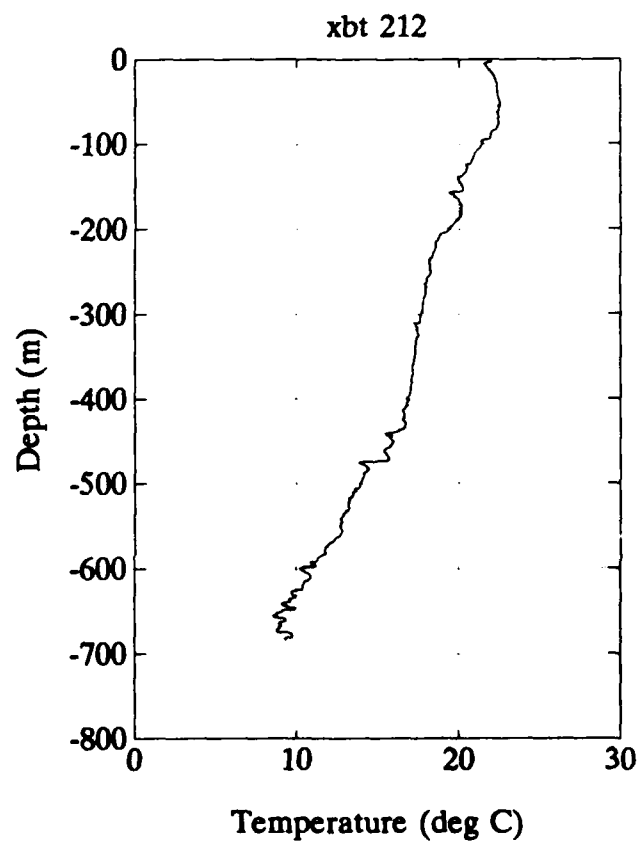
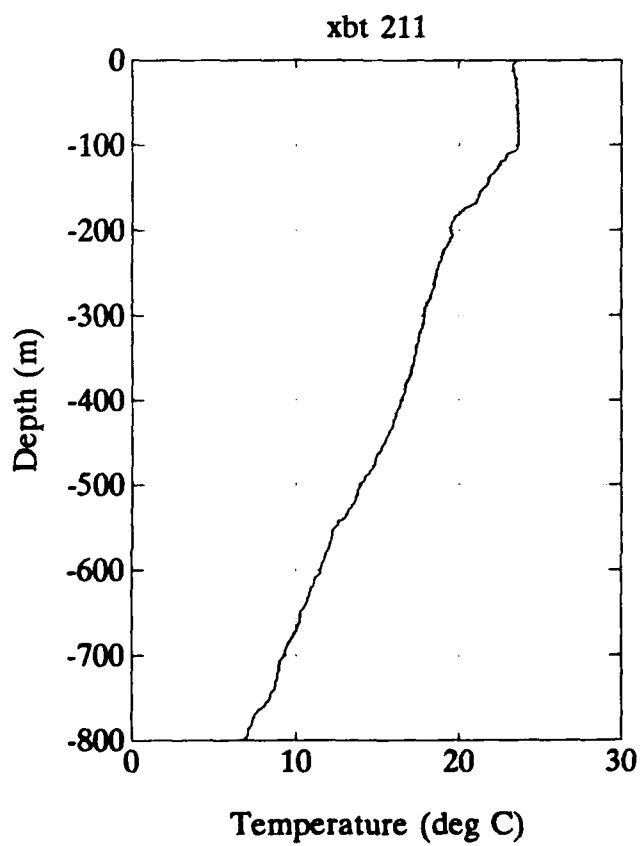
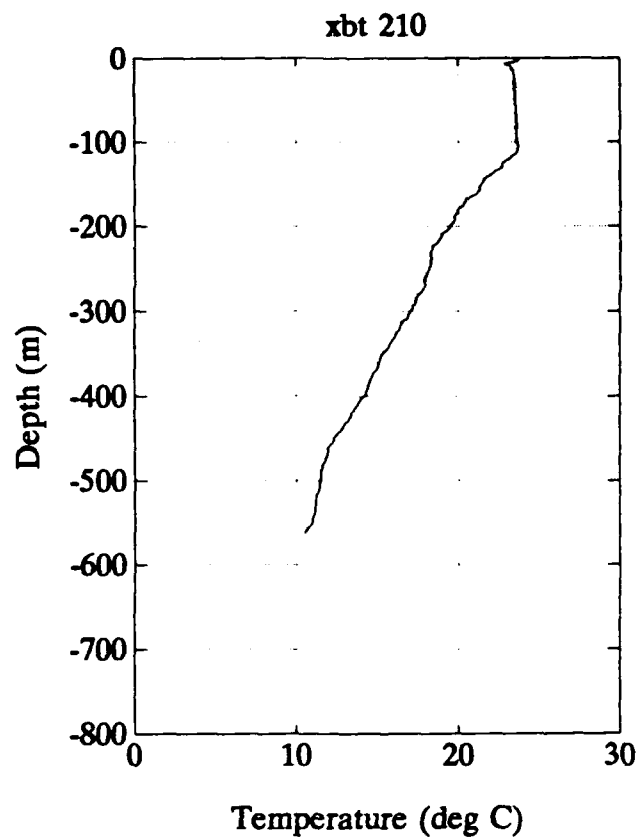
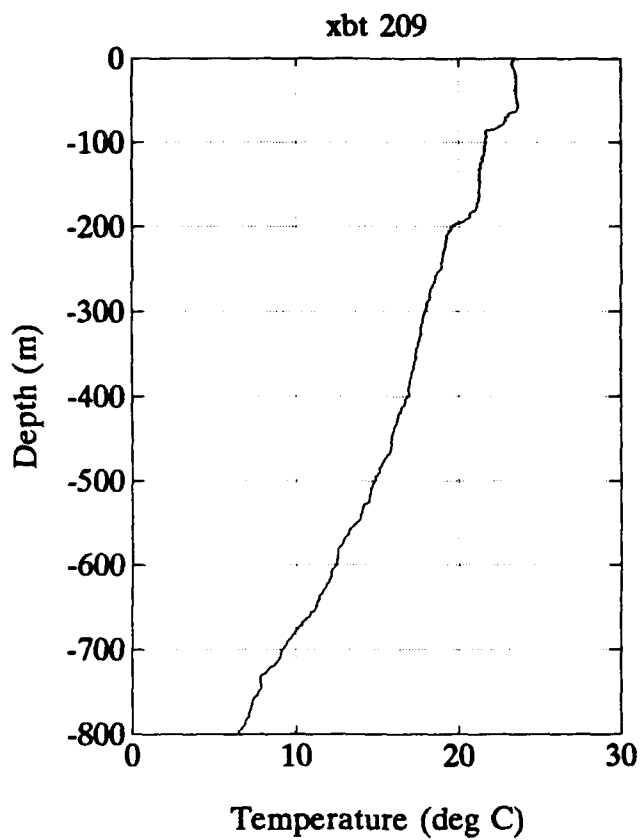


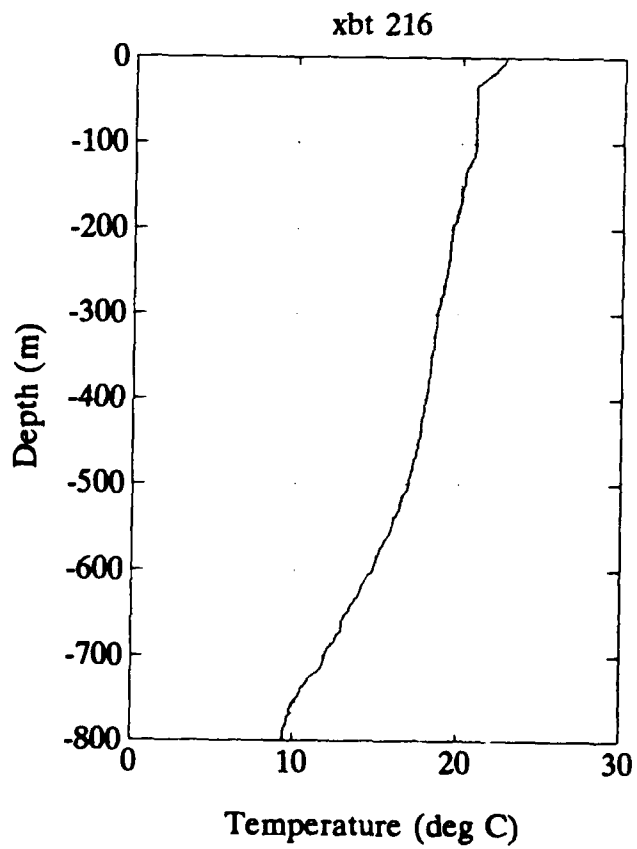
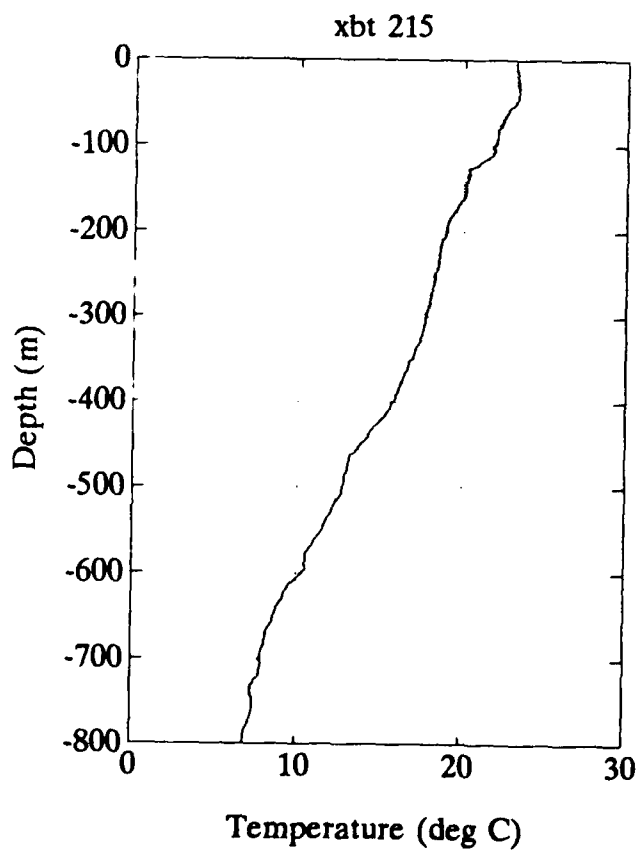
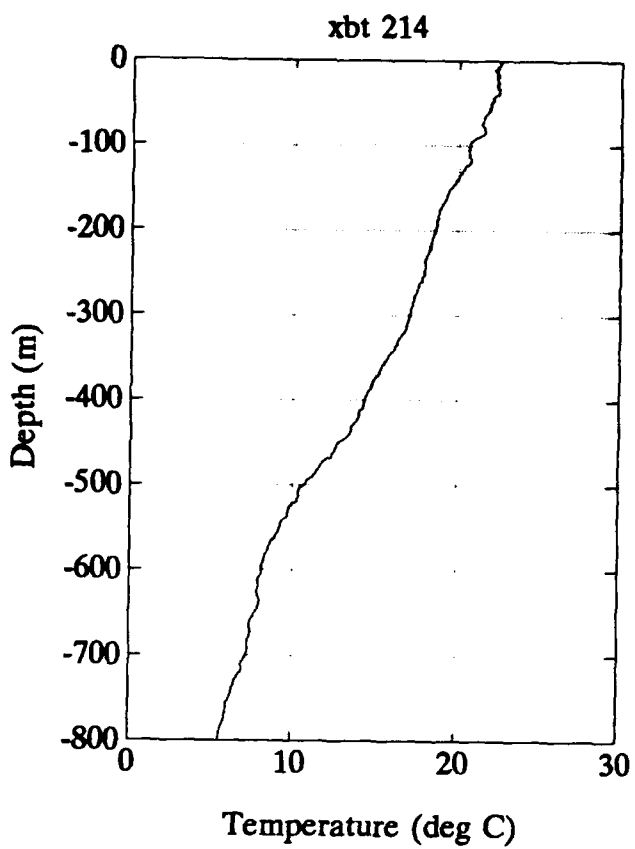
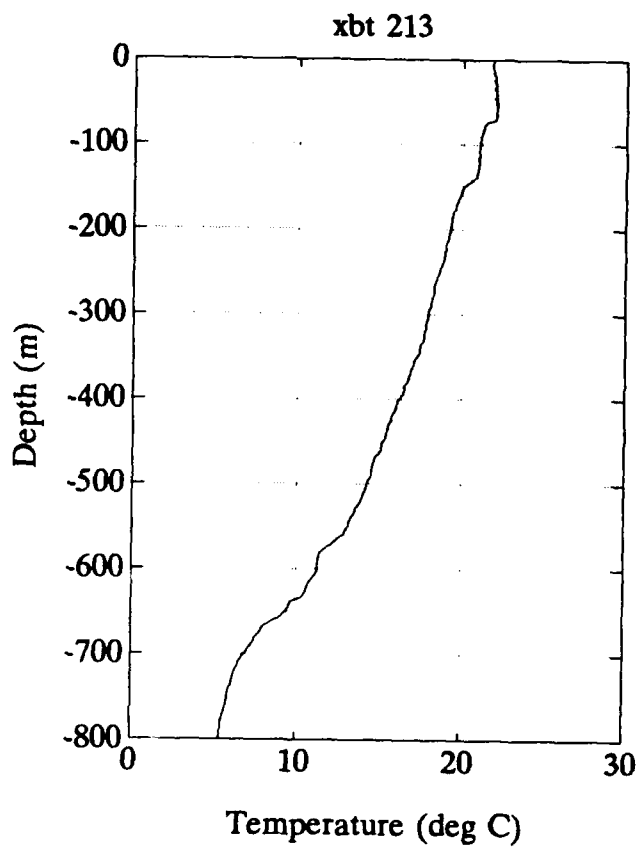


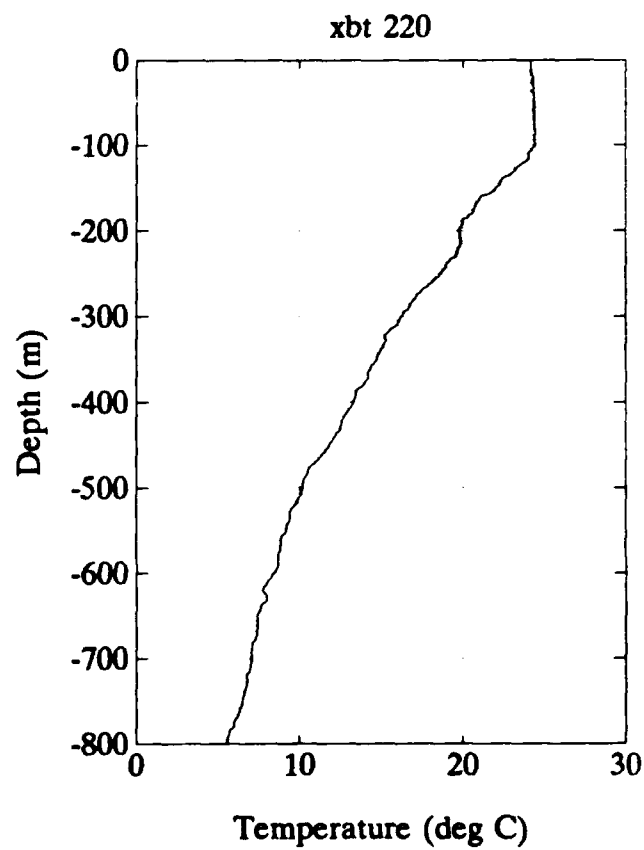
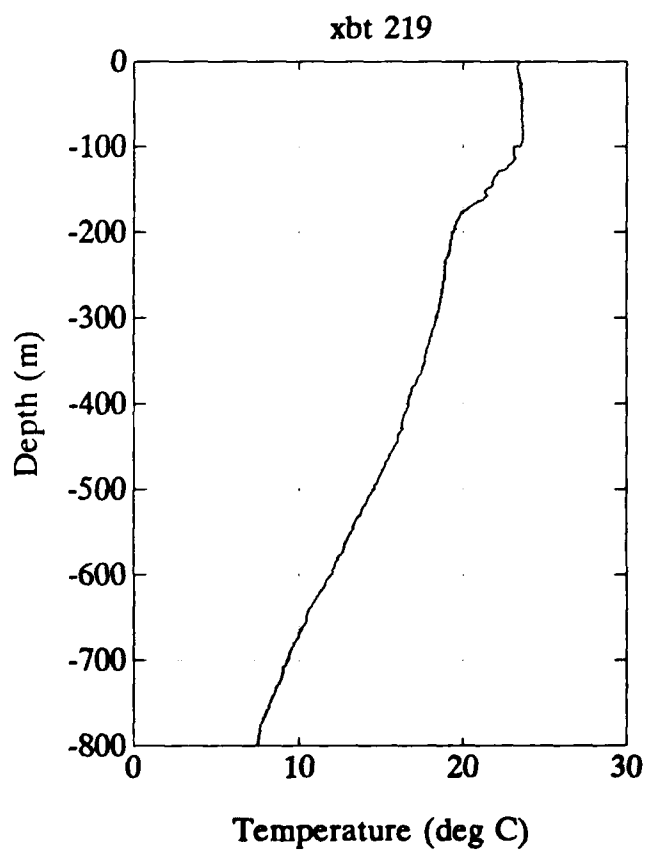
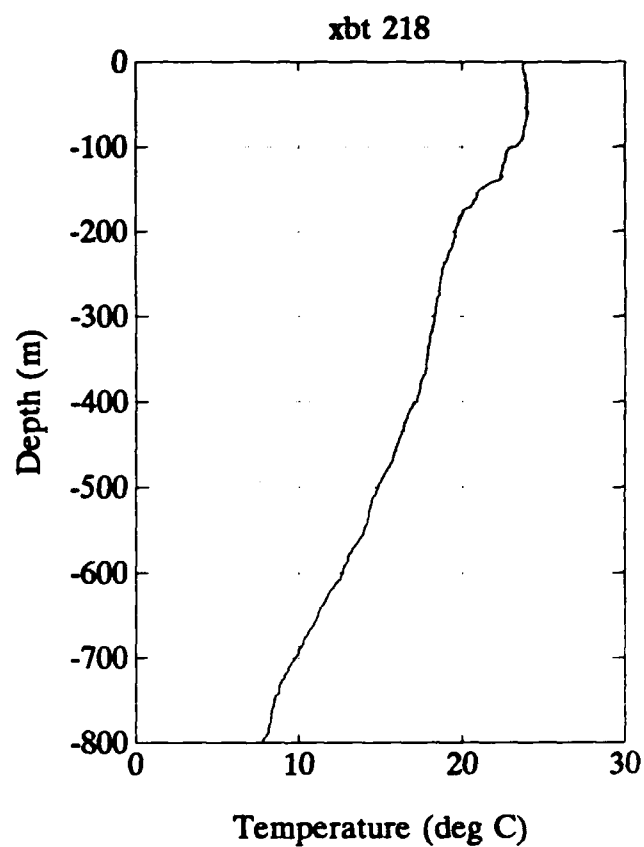
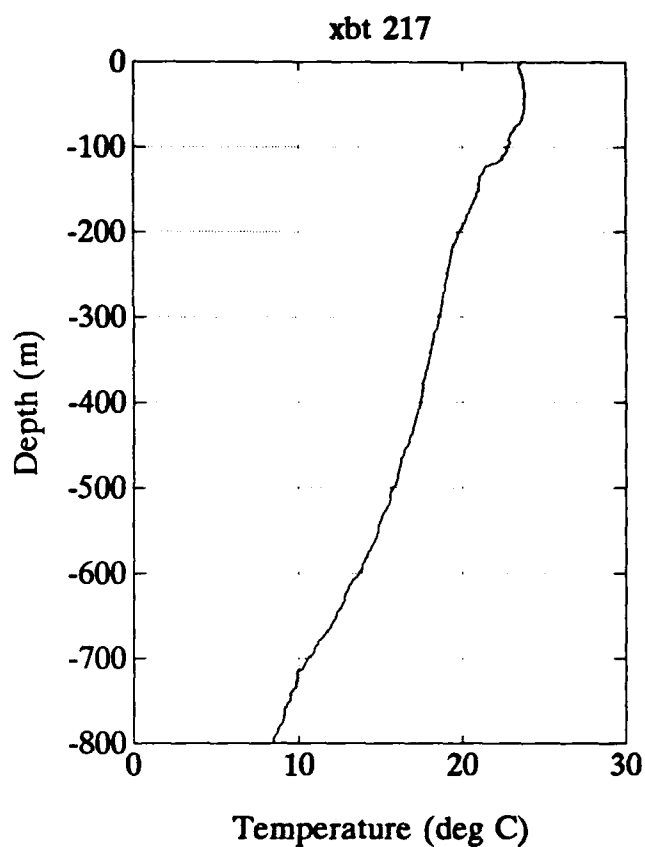


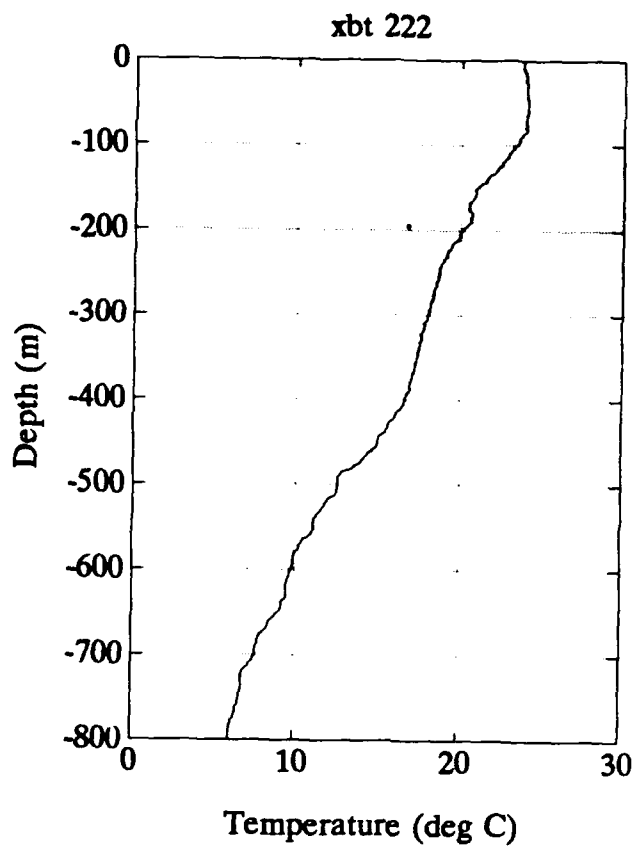
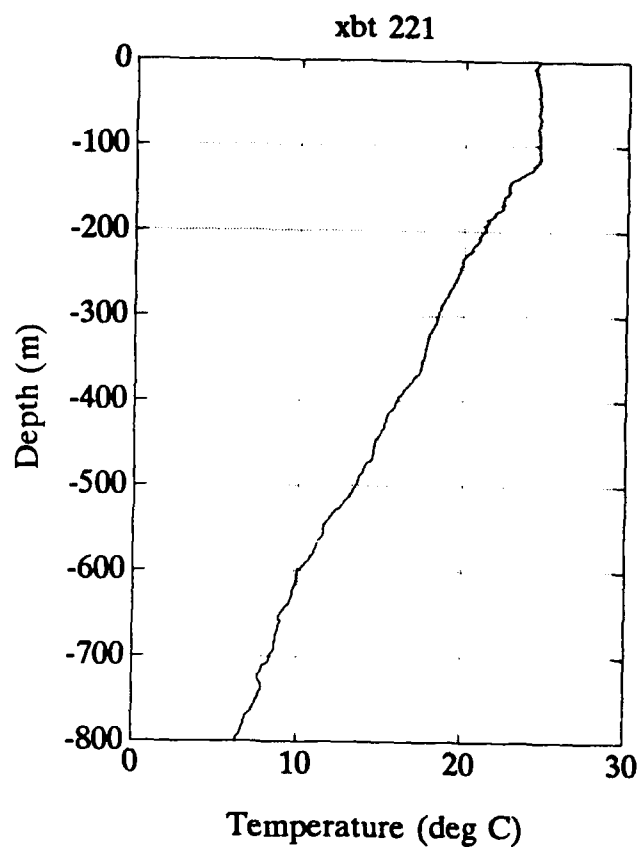












## REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified			1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution for public release; Distribution is unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE				
4. PERFORMING ORGANIZATION REPORT NUMBER(S) University of Rhode Island Graduate School of Oceanography GSO Technical Report 92-2			5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION Univ. of Rhode Island Grad. School of Oceanography		6b. OFFICE SYMBOL (If applicable) 1122 PO		7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) South Ferry Road Narragansett, RI 02882			7b. ADDRESS (City, State, and ZIP Code)	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Office of Naval Research		8b. OFFICE SYMBOL (If applicable)		9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code) 800 N. Quincy St., Arlington, VA 22217			10. SOURCE OF FUNDING NUMBERS	
			PROGRAM ELEMENT NO.	PROJECT NO.
			TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) The SYNOP Experiment: XBT Data for the Period January 1988 to February 1990				
12. PERSONAL AUTHOR(S) Sandra Anderson-Fontana, H. Thomas Rossby				
13a. TYPE OF REPORT Summary		13b. TIME COVERED FROM 1/88 TO 2/90		14. DATE OF REPORT (Year, Month, Day) May 1992
15. PAGE COUNT 75				
16. SUPPLEMENTARY NOTATION				
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	SYNOPSIS, XBT, Gulf Stream	
19. ABSTRACT (Continue on reverse if necessary and identify by block number) From the end of January 1988 to February 1990, 214 XBTs were deployed in the Gulf Stream as part of the SYNOP experiment. The XBTs were used to determine the launch sites for a total of 82 RAFOS floats in the axis of the Gulf Stream, identified as the point at which the 15°C isotherm crosses 450 meters.  Two to four XBTs were typically used to determine each float launch site. This report presents all the SYNOP XBT data, and examines the variability in the Gulf Stream axis position during this period of time.				
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION	
22a. NAME OF RESPONSIBLE INDIVIDUAL			22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL